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EDITORIAL.

THE OFFICES of THE ENGINEERING AND MINING JOURNAL have been removed to No. 505 Pearl Street. The change has been made chiefly with a view to bringing the editorial and business offices and the printing plant under one roof; thereby facilitating the work of publishing the paper, and enabling us to give our readers better service. As soon as the new plant is in complete working order, we hope that the change will be apparent in the improved appearance of the JOURNAL.

Our friends will find the new office easy of access. It is only a short distance from Broadway, and five minutes' walk from the City Hall. We hope to receive many visitors there, as in the old offices.

THE VOLCANIC disturbances off the coast of Japan, resulting in the formation of islands several miles in circumference, will not pass unnoticed by geologists. It is by observation of actual processes in nature's workshop that the study of eruptive activity is most likely to be advanced. Mineral deposits are so closely associated with the evidences of volcanic unrest that mining geologists are eager to get such testimony, at first hand, as will help to unravel this relation. We doubt not that at an earlier period of human history this addition of territory to Japan through plutonic agency would have been hailed as an omen of her extending her boundaries over a hostile domain. The coincidence may yet eventuate.

AMONG THE contributions to discussion appearing in this issue is a letter from Mr. Van Agnew which, apart from the information it contains, is interesting as having come 600 miles on horseback in the mail sent from Akmolinsk to Petropavlosk, on the Siberian railroad.

NO DISTRICT IN the West has suffered more from competition in recent years than the Block Coal region in Indiana. Formerly the mines in this district had an assured market for their output; now we hear of short time, closed mines, idle miners and general depression. In part this is due to over-production and the opening of too many new mines. In a greater degree it is the result of the competition of West Virginia coal, which has secured a strong position in the markets which formerly took the

block coal alone, and is sold at prices which make competition difficult and often unprofitable. It is a hard case for the operators and miners, and no remedy is apparent.

SOME RECENT coal operations are notable for their large extent and the completeness of their installation. One of the most important of these is the opening of the largest unoccupied tract of coal land in the western part of Pennsylvania by the West Side Belt Railroad Company. The latest practice is found there, on a large scale, and the whole constitutes one of the great collieries of the country. The complete description, given on another page, forms a paper of much interest.

THERE WILL BE no strike in the Central Pennsylvania coal mining district, as the operators have decided to continue for another year the present scale of 62 cents per ton for pick-mining. This district does not come under the Interstate agreement, and its special contract expired April 1. The operators had proposed a reduction of 5 cents, which the men refused. They voted to stop work, but will doubtless resume on the concession.

IN OUR NEWS letter on another page, there will be found some particulars as to the proposed consolidation of smelting companies on the Pacific Coast. It is understood that, while this has not been finally closed, the negotiations have advanced so far that only some final details remain to be settled. Briefly stated, the consolidation will include the Selby smelter, near San Francisco; the Tacoma smelter, at Tacoma, and the Everett smelter, at Everett, in Washington. This will leave the Northport smelter, which runs chiefly on British Columbia ores, the only independent custom works in the Far West. Details as to the management and the capital of the consolidation are still to be settled, though there is no doubt that the capitalization will be heavy. The American Smelting & Refining Company appears in the deal to the extent that it owns the Everett plant, and it will, therefore, have a proportionate share in the stock and a voice in the management. To what extent this share will develop cannot yet be told. The most important part of the consolidation is, of course, the Selby smelter, which has long had the chief share of the Pacific Coast business. Its plant is large, and has been well developed under the able technical management of Mr. Alfred Von der Ropp. The Tacoma smelter is also an excellent plant, though of less extent, and has won an important position through the ability of Mr. W. R. Rust.

The one feature in this deal which is to be regretted is the practical removal of an important element of competition in the smelting business. If not actually controlled, there is little doubt that the management will be largely dominated by the American Smelting & Refining Company; at least there will be a community of interest, which may not altogether work to the advantage of the mining industry. No trade is benefited by the control of a single interest, however able the management may be.

MARCH WAS A good dividend month, $18,477,205 having been paid by 43 mining and metallurgical companies in the United States. This is nearly three times the total reported in January, and fully $6,000,000 more than in February. The increase in March was due principally to the declaration by the Standard Oil Company of a quarterly dividend of $14,550,000, against $6,790,000 in December; by the addition of $500,000 to the $1,000,000 quarterly of the Calumet & Hecla copper mine; by doubling the monthly payment to $150,000 of the Bunker Hill & Sullivan Mining & Concentrating Company, of Idaho; by the bonus of $50,000, making $150,000 declared for the quarter on the common stock of the Federal Mining & Smelting Company, in addition to the regular quarterly of $175,000 on the preferred; by the resumption of the extra dividend of 25c. per share, making 50c., or $109,200 monthly, by the Homestake Gold Mining Company, of South Dakota; and by the increase from $1.50 per share to $2 ($40,000 for the quarter) of the Texas & Pacific Coal Company. An unusual payment was $1 per share, or $180,000 by the Alaska Mexican Mining Company, which would have distributed 30c., or $54,000 quarterly in April. In contrast to this is the initial quarterly dividend of 60c. per share, $108,000, declared by the Daly-West mine in Utah, an amount, by the way, considerable less than one-half what would have been paid had the monthly dividend of 40c. per share, or $72,000, been continued. More economic management in working the mine is explanation for the new dividend policy.

The March dividends were distributed as follows: Twenty gold, silver and lead properties, $1,471,283; 3 copper, $2,014,925; 1 zinc, $1,500; 4 coal and coke, $153,317; 14 gas and oil $14,817,180; 1 chemical, $19,000; total, 43 companies, $18,477,205. In addition to these dividends Americans have shared in the payment of $100,000, the first bimonthly, by the Greene Consolidated Gold Company, of Mexico, and $15,000 by a Central American mine.

The "Open Shop" in Alabama.

The yearly meeting of the United Mine Workers in Alabama, which takes place shortly, seems to offer an opportunity for the adjustment of the trouble which has existed in the coal mines of that State since last July, when the miners went out on strike. Nearly all of the commercial coal operators either conceded the demands of their men or else made a provisional agreement to pay whatever rate should be finally adopted. The large iron companies, who are the principal owners and operators of coal mines in the State, refused to make any terms. After a time, finding the union stubborn, they declared themselves in favor of the "open shop," and have been working on that plan for over half a year. Men have been brought from other States, or hired as non-union men at home, and the mines have been kept at work. In this the companies have been helped by the fact that they hire from the State, and from county authorities, a large number of convicts, who have no option but to keep at work. This force formed a reserve which could always be relied upon, and which the strikers could not touch. By the use of this, and by hiring new men, the production of the State in 1904 was kept up nearly to the level of the previous year. The consumption increased, however, and a shortage has been felt at times, especially in coke, so that it was necessary to bring coke from West Virginia, to supply the increased demand from the blast furnaces.

It is most probable that the large companies will submit no wage scale to the coming convention. While matters are not entirely satisfactory, the position is improving, and it looks as if the companies would adhere to the "open shop" and ignore the convention. Whether that body will give up a contest which has been practically decided against it, or whether it will decide to keep up the form of a strike, remains to be seen. In either case, unionism in the Alabama coal mines is gradually ceasing to be an important factor.

The result is due partly to the use of the convict force above mentioned, and partly to the fact that most of the miners are negroes, a class always difficult to hold and manage as a striking body. For two years or more the mines had plenty of work and better wages than ever before, so that they seem to have lost more than they can possibly gain by holding out.

Air Blasts.

In our last issue the Chief Inspector of Mines for New South Wales gave an interesting account of the 'explosive' rock which has been the cause of several accidents in the mines of the Hillgrove district. Incidentally, he made references to similar occurrences in the Mysore and elsewhere. Then followed an analysis of the current explanations of this phenomenon, with his own conclusion that it is due to the sudden release from strains caused by pressure. This view of the matter will commend itself to those cognizant of the facts he mentions and of similar facts—for instance, in the copper mines of Lake Superior. There they have 'air blasts,' of explosive violence, which are imputed variously to earthquakes, to gases and to the 'little men,' the gnomes, who, according to ancient folk-lore, are supposed to delve underground what time the miners are absent. As a matter of fact the explosions do usually occur by night, for the same reason that a mill-wheel runs faster then, and that earthquakes coincide with the darkness, namely, because that part of the earth is furthest from the sun. However it be, these 'air blasts' are a frequent incident of mining in the Keweenaw peninsula, and such well-known mines as the Quincy and the Atlantic have been troubled with them quite recently. They occur in the mines which have large 'leeries' (worked-out stopes), a Cornish term borrowed from the Saxons and derived from *leer*, empty. The 'air blast' is due to the crushing of pillars of ground under the excessive weight of overlying rock. Where the hanging-wall is strong, and therefore does not yield between pillars, it crushes them; the fall of these slabs of rock causes a sudden expulsion of air. Where the vein is inclined flatly, as in the case of the Quincy with its dip of 37°, there is a big 'overhang'; and, as enormous areas of orebearing ground become excavated, for a length and a depth of several thousand feet in both directions and for a width of 8 to 20 ft., the pressure becomes excessive. In such cases, as the old stopes are abandoned, the pillars which safeguard the workings become a source of danger, because they prevent a gradual settlement of the ground; it would be as well to rob the pillars and allow the hanging to come down and 'key' itself. The recommendation of Mr. Jaquet, in regard to the use of the soft head-boards with stulls, recognizes the necessity for taking up the pressure gradually, and it is applicable to small veins. Where timbering is used sparingly, as in the most progressive mines of the Lake Superior copper country, the idea of releasing pressure can be applied in other ways. 'Air blasts' are no inexplicable eccentricities of nature; they are the consequence of mining operations, and the only safeguard against them is an intelligent study of conditions underground.

Taxing Coal Production.

At the present writing the fate of the bill reported in the Pennsylvania Legislature to impose a tax on all coal mined in that State is still in doubt. It is favored by the Governor of the State, who suggested it in the first place, and was approved by the committee to which it was referred. On the other hand, it is opposed by the coal operators, naturally; by the coal miners' unions, and by many others who have no special interest in the case. Governor Pennypacker, whose views on economic questions seem to be about as narrow as those he holds on the public press—which brought general derision on his message a year ago—recommended the tax in order that consumers of Pennsylvania coal in other States might be made to pay a share of the burdens resting on the people of that State. It is hardly necessary to say that such a reason is absolutely fallacious.

On general principles alone, such a tax is part of a thoroughly bad economic policy. No publicist, with any regard for his reputation, would venture to defend taxes on productive industries, or would suggest burdens on the absolute necessities of life, except under pressure of dire necessity. Such taxes directly affect all consumers, and in greatest degree those who are least able to bear any additional burden—the wage-earners and small consumers, who are practically the same class. In fact, such a tax is a double oppression, increasing the cost of living, while, at the same time, it affects the costs of manufacturing, and consequently the rate of wages. It may be said that the tax would fall upon the corporations; but this is absurd, since it would be passed on by them to the consumers at once. It is hardly necessary, however, to enlarge upon points the force of which must be readily admitted.

Apart from these general considerations, there are some special reasons against the proposed tax, arising from local conditions. The amount of the tax—three cents per ton—may seem small, but it is quite enough to affect existing conditions seriously. In the case of anthracite coal the effect would be comparatively simple. The anthracite trade is so unified and the market for anthracite so largely a settled one, that the result of the tax would be only a small increase in the price to consumers; and this would not be sufficient to affect the consumption in any material degree, except so far as the steam sizes come into direct competition with bituminous coal on the seaboard.

With bituminous coal the case is different. Pennsylvania mined last year, in round figures, 100,000,000 tons of bituminous coal, and a very large proportion of this—all that is consumed outside of the western and central sections of the State itself—is sold under competitive conditions. The coal which goes to the seaboard has to meet the rivalry of the Cumberland, New River and Pocahontas coals; that which goes westward to all the large cities and manufacturing centers, and through the lakes to the Northwest, must compete with Ohio, West Virginia, Indiana and Illinois coals; while the Mississippi trade is already affected by shipments from West Virginia, Kentucky and Alabama. Some three-quarters of the bituminous coal produced in the State is mined under the conditions of the Interstate agreement, which fixes the wages in Ohio, Indiana and Illinois, as well as in Pennsylvania. As we have said above, three cents per ton does not seem a large sum; but it is enough to affect a competitive trade, in which profits must be very closely calculated. If the tax is imposed, the Pennsylvania operators must ask for a differential in wages to put them on a level with other States, so that the miners will be directly affected. They will have the alternative of lower wages or less work, and the two come to the same thing in the end. The first result of the tax will be a contest when the wage scales are adjusted next year.

Such a tax on production will be bad,

both in principle and practice; and we trust that the efforts to defeat it will be successful.

Market Conditions.

April 5.

The metal markets are in good condition. While domestic consumers are taking copper only for their immediate requirements, the foreign demand continues strong, especially from Germany. The official statements show that exports in February were larger than those of last year; and the same was doubtless the case in March. Tin is still scarce for spot deliveries. Lead is quiet and steady, while spelter continues rather weak.

Silver has been rather dull, but without much fluctuation.

The iron markets continue strong and active and there are signs of continued activity in nearly all directions. The railroads have been buying heavily for bridge and other work, but still hold back on rails.

The western coal markets show no change. Shippers are getting ready for the Lake trade. In the East the coal markets are in good condition for the spring trade.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

The essential difference in the properties of metals produced by a small quantity of foreign matter introduces a distinctive feature of metallurgy, namely, the enormous influence exerted on a large mass of metal by a trace of another metal or metalloid.

Acetylene is used for lighting over 100 towns in France. The gas is made from calcium carbide. In 1903 the consumption of the latter was 14,500 tons.

A new material which resists acids is the so-called 'neutral iron'; it costs only half as much as phosphor bronze. It is promised a large and varied future.

The gold in the sea-water of the Bay of Biscay, according to J. Loevy, is less than one-sixtieth of a grain, or about one milligram, in a ton.

The lead fluo-silicate cell is suggested as a voltmeter, with an anode of pure lead, and a cathode of lead or copper. One part gelatine in 3,000 parts of solution is a factor in throwing the lead down in dense, cohesive and non-crystalline form. The high electro-equivalent of lead should prove convenient here.

The so-called Powell process of timber preservation by means of sugar or syrup is now being experimented with in England. The method consists practically in boiling the wood in a "compound saccharine solution, whereby the latent air is driven out and the albumin and sap coagulated." After the wood is thoroughly impregnated, it is dried at a high temperature.

Safety-Lamp Regulations in Belgium.

As a result of the series of experiments on safety lamps carried out under the direction of M. Victor Watteyne, chief engineer of mines, at the Frameries testing station, the Belgian Mines Department has amended the regulations governing the use of safety lamps in coal mines. The new orders, which are to govern both gaseous and non-gaseous mines, will go into effect August 1 next; they are of interest outside of Belgium also.

In non-gaseous mines the use of candles, miners' lamps and other naked-flame lights is forbidden. A sufficient number of safety lamps, in good condition, must be kept at each colliery for inspecting places where the existence of gas may be suspected.

In gaseous mines safety lamps of certain specified patterns and dimensions must be used for all work at the breasts. Each lamp must have an approved locking device. These lamps must be kept at the mine; they must be inspected daily, and must be cleaned, refilled and kept in good condition by designated persons, who are not to be paid by the piece, and who must not have any interest in the cost of keeping the lamps in order. At the moment a miner is to go below, his lamp, securely locked, is to be given him, and he then becomes responsible for it. Bosses and miners are forbidden to open lamps underground, and they must not have on their persons any appliances for unlocking a lamp. If a lamp goes out, it must be relit only on the surface, unless it is provided with a re-lighting device. In slightly gaseous or moderately gaseous mines, however, lamps may be re-lit at a designated station, near the foot of the intake shaft. If a miner's lamp is damaged, he must put it out on the spot. If a lamp having a re-lighting device is extinguished by a fall, or a blow, it is not to be re-lit until the possessor has assured himself that it is in good and safe condition.

The safety lamps permitted in the collieries are the Muessler-Marsaut, the Wolf, the Fumat and the Body-Firket. In slightly gaseous mines, the first three can be used without bonnets; in other mines the bonnet is obligatory.

The use of copper gauze, instead of iron gauze, is permitted for surveying lamps only.

A Volcanic Island.*

Extraordinary details of the birth of a new island have just reached Tokio. On Nov. 14 the inhabitants of Iwo island, near Bonin island, in South Japan, were startled to hear a great rumbling. A fortnight later vast clouds of mingled black and white smoke rose out of the sea three nautical miles to the south of Iwo island.

At first the simple-minded inhabitants thought that a fleet was in the vicinity, but the smoke-clouds increased in volume, presenting a wonderful sight, as though the sea were on fire. On Dec. 5 a little island appeared amid the smoke-clouds, and three days later it seemed as if there were three islands. The people left their work, assembled on the shores, and watched the phenomena. At night all was blackness, or intense darkness.

It became recognized that the event was due to a volcanic eruption. The smoke now varied in color, sometimes being of a vivid red. By Dec. 12 one large island was to be seen gradually rising. In conformation it was a hill toward the east and a sloping plain to the west, and on the 14th the shape of the island was that of a long slope, emitting white smoke and resembling moist land when steaming under the influence of a fierce sun. The slope, on Jan. 2, underwent a change gradually from the center, and became higher on the west side. Vast volumes of white smoke poured out in the morning, and then in the afternoon an enormous quantity of black smoke was emitted.

The residents of Iwo island now became alarmed and held a meeting, and ten men volunteered to set out on a voyage of discovery. All solemnly declared that they would find out what had happened or perish in the attempt. They went in a 30-ft. long boat and a canoe, and were fully prepared for the many delays which might be caused by the weather. On Jan. 31 they anchored off the north coast of South Iwo island, which is uninhabited. The recent eruption had covered the island with a layer of ashes, the grass had been burnt up, and all was desolate.

These hardy voyagers arrived at the newly formed island on Feb. 1, but when they were three nautical miles to the southward of South Iwo island the canoe capsized in the heavy waves, and the men had some narrow escapes. They found the new island to be 2,300 *ken* (nearly 2¾ miles) in circumference, and 80 *ken* (about 480 ft.) above the surface of the water. There was a boiling lake to the north. The south coast was a precipitous mass of rock, covered with a thick layer of earth. On the highest point of the island a pole was raised with the Japanese flag and an inscription: "New place. Great Japan. Many *banzais*." The discovery has been reported to the governor of Bonin island, who has named it Nüshima.

**The Daily Telegraph*, London, March 21, 1905.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THE IODIMETRIC DETERMINATION OF COPPER.

The Editor:

Sir—There has been, of late, considerable discussion regarding the potassium-iodide method of assaying copper, and various views have been aired, both for and against this. The sole reason left for considering this method to be less accurate than the battery assay is the fact that aluminum, alone, may not always completely precipitate the copper. This is granted; but if, to the small square of sheet aluminum, a smaller square of platinum be hooked on by a platinum wire, this objection will be removed. For this method I was indebted, years ago, to Mr. Welsh of the Trail smelter, in British Columbia. Provided that one obtains all the copper in a metallic form, it is mere trifling with valuable time to 'monkey' with the battery assay; for, in my mind, all doubt regarding the accuracy of the iodide assay, as compared with the battery method, has long been removed. We refine our own copper here, and it is part of our daily routine to assay metal running up to 99.56%. Our results are checked in Moscow by the battery method; and we invariably agree.

Of course, it is not necessary to precipitate on aluminum metal with a content as low as 95%; for our daily work, the battery would be useless. We must have our results as quickly as possible in order to allow the metal in bars to be stored in the proper place according to its percentage grade. Waiting for the battery would compel us to keep our metal lying about, and it would also increase the cost of handling, beside involving other obvious risks. From the time that the drillings are ready for the assay, it is only a matter of four hours, giving ample margin, to get results from eight separate samples of bar copper. It might be interesting to give some practical details, but your readers will find exactly the same method described in the eleventh edition of Peters' 'Modern Copper Smelting,' with the exception that I find it necessary, when dealing with 99% copper, or higher, to standardize every day. If one will follow Peters faithfully, and will titrate in an absolutely cold solution, he will have no trouble with his 'end point,' and if there is any recurrence of the blue color after standing, it is, in my opinion, a faulty assay, low results being due to insufficient hypo. It is the evaporation of the nitric acid solution which determines whether the end point will be clear or cloudy. If the solution is evaporated to 1 c.c. or less, and to the consistence of heavy oil, containing even a few crystals, the free nitrate will have been driven off sufficiently to allow of complete neutralization when boiled with ammonia. For working upon metal of a grade over 99%, the ordinary strength of the hypo, as given in text-books, is far too strong. A solution containing 21.5 grams of pure sodium hyposulphite in two liters of distilled water will be found strong enough. This means that a 100-c.c. burette must be used; this should be graduated to 0.05 c.c., and should be pierced with so small a hole that to empty completely a full burette should require at least four minutes. Even then every two drops of hypo solution, of the strength indicated, will represent, approximately, 0.01% of copper; and, when one drop is sufficient to clear the end point, from certainty of the presence of free iodine, to certainty of its absence, it is not necessary, or advisable, to weaken the solution further.

For refined or crude copper, where precipitation on aluminum is not needed, the treatment and titration take place in the same 300 c.c. Erlenmeyer flask; and if 0.25 gram of copper drillings is used, and if there is not more than 25 c.c. of solution in the flask when ready for titration, the 85 to 92 c.c. of additional hypo solution will be easily accommodated. Ninety-one separate assays averaged 91.211%; drillings from these merely mixed together, not re-melted, gave as a result of the average of six separate samples, 91.206%. Given an equal accuracy, the difference between the battery and the potassium-iodide methods is simply a question of time; and, even in central Siberia, time insists upon being money, although all Siberians have not yet found it out.

F. VAN AGNEW.

Spassky Copper Mine, Akmolinsk, Siberia, March 2, 1905.

GOLD IN SEA WATER.

The Editor:

Sir—In your comment on the origin of gold in the quartz veins of Victoria you assume that the Silurian ocean contained gold in solution, just like the sea water of today.

It is still a mooted question in what combination the gold exists in sea water; some scientists claim as a chloride, others contend as an iodate. It is true that the salts of gold are easily reducible; still, the enormous dilution of the gold in sea water counteracts the reducing influences of organic matter. The chloride and the iodate of gold are deliquescent, and during the evaporation of sea water one would expect these salts to concentrate in the mother liquor, and finally, toward the end of the process, to crystallize.

Deposits of salt exist in all ocean sediments, no matter of what geological age. To prove your contention that gold existed in the Silurian sea water, it would but be necessary to prove its presence in the salt deposited during that time. For the reasons, however, previously given, it would be futile to look for it in the rock-salt; it could be detected only in the mother liquor or in the carnallite and similar salts derived from its further evaporation.

The climatic conditions which should prevail for the preservation of such deliquescent salts as carnallite, etc., are so peculiar that only in rare cases these salts have been found. Enormous deposits of carnallite have been found at Stassfurt, in Germany, but they have been formed during a much more recent geological time than the Silurian, namely, during the Permian period. These salts form the basis of an enormous industry, but I am not aware that in the many years during which these salts have been worked even the slightest trace of gold has been detected. I myself, some years ago, worked up about 50 lb. of Stassfurt carnallite, in the endeavor to detect gold in them, but with an entirely negative result. For these reasons I conclude that the ocean, even during the Triassic period, was still free of gold.

E. E. LUNGWITZ.

Newark, N. J., March 27, 1905.

THE COST OF MINING.

The Editor:

Sir—In proposing this intricate subject, Mr. Ingalls has paved the way for an almost unlimited interchange of ideas upon an important, but neglected, branch of mining. As Mr. Finlay has so well put it, "The problem of deciding upon the best methods, the proper scale of operations and the most desirable working cost to be aimed at, is one big enough for the best business intelligence that a mining engineer can muster."

The subject involves a phase of mining concerning which not alone the newly graduated mining engineer lacks knowledge; it includes problems and conditions which many engineers of long experience have not had the good fortune to encounter. To obtain reliable and well segregated figures pertaining to working costs from the average mine, this is one of the most difficult tasks which the engineer can undertake; unlike the other factors that contribute to mine valuation, the necessary data can be obtained only from written records.

I cannot understand why so many mining companies continue to practice such wasteful brevity. It is a fact that, in most cases where such method is practiced, not only the officers of the company, but their servants also, unconsciously fail in possessing and preserving an adequate knowledge of their true conditions. In estimating the value of a mine it is impossible to separate this factor of 'working cost'; nevertheless, we often read mining reports in which the author may have accurately applied every known principle in estimating the ore reserves, and yet, for want of proper data, he may decline to hazard an estimate of the working costs. The working cost is, to mine valuation, what width is to the assay-value of a given vein.

It does not appear to be a difficult task to standardize the headings to be used in the final classification of mining costs, such as mining, tramming, hoisting, sorting, crushing, and so on, following the different processes used in the treatment of the ore; but to settle upon a uniform method of segregating the items contributing to these accounts, and a correct distribution of the moneys expended, this is a subject which should elicit information both interesting and instructive. For, no matter what the system of time-keeping may be (within economic limits), there are certain moneys which must be distributed without the assistance of detailed record.

Working costs will continue to show variations, in the same districts, under the same conditions of vein-width, capacity, etc., because engineers, like other people, differ in their views of application; but, nevertheless, there are certain fundamental principles to be observed. If uniformity is regarded in mine statements (which reflect the local conditions), a desire to effect legitimate economy will be created, and inferior methods will soon be eliminated. As a concrete example, in illustration of the methods sometimes applied in the segregation of accounts, where milling and cyanidation only are employed, the following will serve; the final summary is given first, in order to elucidate some points more clearly:

SUMMARY.

	Total cost.	Cost per ton.	Percentage.
Mining	$128,787.68	$3.38	45.54
Transport of ore	3,857.18	0.10	1.36
Sorting and crushing	8,625.31	0.22	3.00
Milling	38,963,87	1.02	12.00
Cyanidation	34,586.34	0.90	0.12
Gold realization	4,013.80	0.10	1.42
General charges	22,037.60	0.57	7.8
Office expenses	9,367.60	0.24	3.32
Development redemption. (Depreciation?)	32,451.93	0.84	11.4
Totals	$282,691.31	$7.42	

In order to make the above summary valuable, and comparison possible, it is necessary to know what contributes to the several accounts. This is shown, in case of 'mining,' for example, to be as follows:

MINING.

	Total cost.	Cost per ton.	Percentage.
Salaries	$4,462.88	$0.116	3.49
Wages (skilled)	12,018.84	0.315	9.34
Contractors	10,132.88	0.266	7.89
Wages (unskilled)	26,751.86	0.700	20.78
Food	10,889.82	0.280	8.49
Stores	3,719.11	0.096	2.88
Explosives	12,229.29	0.320	9.49
Charcoal	41.46	0.001	0.03
Fuel (timber)	475.75	0.012	0.39
Maintenance	2,590.76	0.066	2.00
Workshops	817.74	0.021	0.63
Transport	235.63	0.006	0.18
Hospital	539.76	0.014	0.42
Labor premiums	220.67	0.006	0.19
Pumping	10,867.76	0.288	8.44
Compound expenses	3,620.68	0.090	2.8
Compressor charges	633.08	0.016	0.49
Manufacturing and sharpening hand-drills	8,489.17	0.220	6.59
Hoisting	5,702.11	0.148	4.42
Underground tramming	13,040.95	0.338	10.05
Assaying	986.14	0.026	0.76
Surveying and sampling	321.31	0.008	0.25
Totals	$128,787.68	$3.38	

A number of the accounts given herewith, such as maintenance, pumping, underground tramming, manufacturing and sharpening drills, require again to be subdivided, because they in turn contain important factors; with all this the question arises: To what extent does it pay to segregate mining accounts? The remaining items—stores, wages, salaries, fuel, etc.—carry us back to the timekeeper's and the storeman's records. It appears to me that, with the details as given herewith, when accompanied by a correct distribution and a knowledge of the local conditions, the engineer should be fortified with material sufficient to direct the work effectively and to compile reliable forecasts.

Probably one of the most troublesome accounts to deal with, especially in cases where the shares are quoted on the market, is 'development,' to which is charged the money expended in opening up the ore-bearing ground, before and after the reduction of ore has begun. The common interpretation of the term makes it include all operations (such as driving, cross-cutting, sinking—exclusive of main shafts—raising, holing, sampling, assaying, surveying and handling the barren ground) which result in the opening up of ore.

Up to the time when milling begins, we will assume that $50,000 has been expended upon development work, and it is estimated that 100,000 tons of ore have been developed, hence an obligation of 0.5c. per ton has been created; but a part of this money has contributed toward the partial exposure of other tonnage, which, however, cannot be accurately estimated. In order to arrive at the cost per ton of the developed ore, the measurements taken underground are used, while the money spent is redeemed upon the basis of the tons milled. These two figures seldom, if ever, agree; and, while the sorted product will account for a part of the discrepancy, there are always large differences between the tonnages as measured underground and the combined total of tons milled and sorted.

In addition to this consideration, there are monthly expenditures on account of development work. The cost of development per ton over any period, as one month, depends upon the width of the vein encountered, the relative position of orebodies, labor conditions, etc., during that period; thus, if development costs are charged to the current-month expense, wild fluctuation will occur in the working costs. Such irregularities create a feeling of uncertainty, which might be followed by forced sales of the shares and consequent depreciation, a result not tolerated in some mining centers.

Before the reduction of ore has begun, the cost of developing a certain tonnage is far greater than at any other period, because administration and other constant charges must be wholly carried by this account; hence it seems only fair that certain adjustments should be made in redeeming this expenditure, otherwise the present shareholders become unduly taxed for the benefit of future holders. In some instances the expenditure on account of development up to the time milling begins is charged to 'capital account,' and written off in the same manner as machinery, reservoirs, or other permanent equipment; in such a case only the current-month expense is charged to working costs.

Another method of discharging this obligation is by creating a 'suspense account,' by charging the development expenses to the reduction stage, and the excess development for each month thereafter to this account. Then a fixed charge is made monthly for development, and the 'suspense' account is written off in annual sums, which are measured by the work of the previous year. This method seems to give satisfactory results.

It is desirable that the methods of distribution be reflected in a statement of working costs, accompanied by the application of certain definite principles. 'Capital' account is generally elastic and often much abused. The items usually charged to this, such as machinery and plant, buildings, main shafts, etc., are supposed to cover expenditures on permanent work and equipment. If the conditions are such that the life of the enterprise can be calculated accurately, the treatment of this account is simple, and the capital can be amortized at a certain computed rate of interest. If this account be not embodied in a statement of working costs, nor referred to therein, effective work in mine equipment is not reflected. Hence, for this and for other less weighty reasons, it would seem important that a certain life be assumed, or other measures taken whereby the moneys might be redeemed upon a fixed basis, without creating an unduly heavy charge.

A discussion that will conduce toward standardization of mining costs, as well as to method in other departments, will prove of invaluable service, both to the engineer and the investor.

F. C. ROBERTS.

Berkeley, Cal., March 7, 1905.

THE METRIC SYSTEM.

The Editor:

Sir—I have read with interest the letters which have recently appeared in your columns on the metric system, and while some of them have stated the arguments fairly well, it does not seem to me that they have made much progress, or that they are any nearer to an agreement than before the discussion began. This question has been fought over and talked over at different times in recent years, and the arguments *pro* and *con* may really be reduced to a few words. The trouble is that it does not seem possible to convince many people who have formed their

opinions, apparently with little thought. So far as the abstract points are concerned, there is really little argument against it. Whether the originators of the system made an error in their calculations, so that the meter is not an exact unit of the earth's diameter, matters not at all. At any rate, the system is an intelligible and coherent one. Calculations in it are easy; its units all have an intelligible relation to each other, and it can be readily understood and remembered. On the other side we have a mass of inconsistent units, which can be mastered only by an effort of memory, which every schoolboy is required to make, but which he finds extremely hard to retain in his mind. An intelligent man or boy can master the metric system in a few hours, and will have little difficulty in remembering the whole of it. But I doubt whether the ordinary man, even one who is familiar with commercial matters, can tell you offhand the mysterious differences between troy, avoirdupois and apothecaries' weight, the contents of a standard gallon, or a good many points connected with our present so-called system. The reason for this is, as I hinted above, that there is no relation whatever between the different units of length, measure—wet or dry—weight, or anything else, and everything depends upon the sheer effort of memory. This does not stay by us, except with constant practice. I once knew an engineer—a good engineer, at that—who had charge of the construction and maintenance of several important roads, who spent most of his spare time on the theory that the English system was of divine, or semi-divine, origin. He even wrote a book, which was not bad reading, to prove that the origin of all measures could be deduced in some abstruse way from the great pyramids of Egypt. I do not think that he found anybody to believe in his theory, with the exception of a few enthusiasts; but to read the outgivings of some of the opponents of the metric system, you would imagine that the inch, the pound, the gallon were inculcated by divine law, and that it was sacrilege to say anything against them. I am not familiar with the textile manufactures, to which a recent correspondent of yours refers at some length, but I confess that I am utterly unable to see how 'warp counts' cannot be made just as well in metric system as any other way. By the way, I should have said that the engineer above referred to, once in my hearing confessed in a rather shamefaced way that he always used metric measures in calculating his bridge strains. He decided that it was much easier to work them out in that way, and afterwards to convert his results into our measures, than it was to go through the whole business with feet and inches.

When it is analyzed, the opposition to the adoption of the metric system derives its chief strength from that dead weight of conservatism which is more or less powerful in all human affairs. We must go on using feet, inches and all the rest of them to the end of time, because our fathers have done so. This spirit is very strong, I confess, and it has probably had its influence from the beginning of time. I have no doubt that when our remote ancestor, Tubal Cain, first began to work iron, there was strong opposition to the use of the new material. Probably the great tool-making house of Methuselah & Company, Inc., mourned publicly over the ruin which must come to the long-established industry of Mesopotamia, and the enormous waste of invested capital which must occur should the new material be adopted. Quite possibly, if we could get at the records, we would find that the head of that eminent house made long speeches to show the absolute absurdity, not to say wickedness, of using material which must be torn from the earth, and then tortured by fire before it was available. It was not until the man with the iron plow and the iron axe showed that he could do five times as much work as with the stone hatchet and the burnt stick, or until the tribe which had secured a few iron swords and spears made mince-meat of the opposing tribe, armed with flint knives and wooden clubs, that Tubal Cain was recognized and his discovery adopted; and even then people doubtless sighed after the good old days.

To speak seriously, there are only two valid arguments against the adoption of the metric system, and those two are the actual inconvenience of the change to the people and the expense involved. The first may be disposed of easily in everything except the land measures. In these days of improvement and novelty it will take people a very short time to learn to use kilograms and meters. Many of them have been accustomed to it already abroad, and the rest will not, I believe, find it hard to take to the new system. The land measure part of it is really a formidable obstacle, on account of the mass of records in existence regarding land titles, all of which are based on the old measures; but even this, I think, could be overcome, although it would take time.

Expense is the great objection. It would fall, of course, most heavily on manufacturing houses, who are able to voice their objections, and have influence to make them heard; but I think this has been to a considerable extent exaggerated. We are told, for instance, that in a large machine shop the expense of changing gauges and measures would be very large, to say nothing of drawings and blue-prints. A little instance which came under my observation, when I was a good deal younger and happened to be working in a locomotive shop, may be to the point. The shop in question had an important order from a foreign railroad for locomotives, which were to be built to specification, and all the figures given were metric. Not much trouble, however, was experienced in making the drawings, patterns and the rest. Moreover, it was required that a full set of gauges and templets be furnished the railroad company for use in doing repair work. A spare set of standard gauges was taken for this purpose, and the whole work of changing them amounted to less than a day in the tool-room. A number of them needed only a little time on a grinder.

It may be said also that, while the total expense of changing the system can be figured up so as to represent a formidable sum, yet this cost would be distributed among a large number of people, so that it would be light in all except a very few cases.

However, it is not much use to talk further on this subject. Apparently, minds are made up on both sides, and the only way is to do something, or decide not to do it. The most practical way to do is, as your correspondents have urged, by positive action through the government. When the Custom House, Post-office and all the government institutions work in metric measure, the people will soon follow—and wonder why it was not done before.

INVESTOR.

New York, March 21, 1905.

[This discussion is now closed.—Editor.]

Hall in America and Héroult in France share the honor of the discovery and application of the electric reduction of aluminum.

Carborundum was first used as an abrasive, a substitute for emery. Then it was used as an ingredient of refractory brick and lute; and now it is proposed to use it also for a corrective in controlling the composition of steel.

It used to be stated that carbon dioxide would not support combustion. Later it was found that metallic magnesium burns in the usually inert gas, with liberation of carbon. Metallic calcium, which is now a commercial product, follows magnesium in burning in carbon dioxide.

The double carbide of chromium and tungsten is a new substance produced by Moissan in 1904; it is resistant to corrosive acids and alkalies, and scratches corundum, but not diamond. A new carbide of molybdenum has also been made, with the formula MoC, the other carbide, Mo_2C, being a previous discovery.

Urea has the formula $CO(NH_2)_2$. Among the recent organo-inorganic novelties is a silicon-sulphur-urea $SiS(NH_2)_2$; it is a white powder slowly decomposing in the air. In this curious analogue of urea, silicon has replaced carbon, and sulphur has been substituted for oxygen.

Mining Stocks.

(Full quotations on pages 679 and 680.)

New York. April 6.

The specialties, Amalgamated Copper, Steel and American Smelter shares, show marked strength, higher prices and promise further improvement. Transactions, however, are not large, and the offering of moderate lots whenever quotations fluctuate rather suggests the effort of insiders to support the market. Amalgamated Copper sold at $80.25@$81, and Anaconda at $19.50@$30. British Columbia copper showed expansion, selling at $7.75@$8, United common at $14@$15.25, Tennessee at $28.25@$29, and Greene Consolidated Copper at $28.125@$28.375. Sales of Greene Consolidated Gold (not 'Gold and Silver,' the new stock which is sold privately at $10@$11), are reported at $7.625 @$7.75. Guanajuato Consolidated of Mexico on one day exchanged 1,200 shares at $4.875@$5. Granby, of British Columbia, came forward at $5.875@$6.125.

In the industrial list there has been some activity in American Smelting & Refining, the 5% common stock selling at $104.375@$105.125, and the 7% preferred at $122.25@$124.

Attention has been attracted by the official organization of the American Smelting Exploration Co., authorized capital, $54,500,000, consisting of $24,500,000 common, $22,500,000 preferred 'A' 6% cumulative and $7,500,000 preferred 'B' guaranteed 6% cumulative stock. The principal asset will be the Guggenheim Exploration Co., which is paying 7% in dividends annually on a share-capital of $17,000,000. The new concern will be practically controlled by the American Smelting & Refining Co., because it owns a majority of the common stock, the preferred having no voting power for the first two years, nor thereafter, unless their dividends remain unpaid for one year.

Boston. April 4.

There have been no important happenings in this market the last week, except the sharp decline in Daly-West, which broke $2.75 to $11.50 and rallied to $13.25 the same day, on the belated news of a threatened flood as a result of a cave in the Ontario mine. The close to-night is $1.12½ lower than a week ago at $14. The steady advance in the price of Amalgamated, which is $3.50 higher than a week ago at $81.50, has had no effect on the local list of mining stocks. Innocuous desuetude is the term that might be applied almost, notwithstanding the fact that a Boston Stock Exchange membership sold for $30,000 very recently, which is the record price. One thing is noticeable, however, and that is the better class of copper-producing properties are being quietly but steadily absorbed without any ostentation. There is, in other words, no aggressive buying, but large interests are certainly in this market picking stocks up quietly. This will be felt sooner or later in the entire list, it would seem.

Copper Range has been more quiet at from $75.50 to $77. United States Mining has stood aloof from the rest of the market in a way, and is being constantly absorbed. Blocks of it were sold Monday with seller options attached, but it was without significance. The buying continues from a New York source, and the price is $1 above a week ago at $27.25. There are intimations that the dividend may be increased this summer. Isle Royale is $1 higher at $25.25, on light trading, and with nothing said.

Dominion Coal spurted $5.75 to $86.75 on knowledge of an impending reorganization, but reacted to $83.25. It is proposed to issue $7,000,000 in 5% bonds and $3,000,000 in 7% cumulative preferred stock, at 112. The present 8% preferred stock will be redeemed at 115, the outstanding bonds at 110, and the floating debt will be paid off.

The Keweenaw Copper Company, which is being exploited here, is meeting with good success considering the conditions market-wise. The 150,000 shares are underwritten at the subscription price of $10 per share.

Colorado Springs. March 31.

The local exchange has shown considerable strength during the past week, and several Cripple Creek stocks have made marked gains.

The production for the month of March does not come up to the average on account of heavy snows, which hindered lessees in their work, but it reaches the total of $1,820,080. The total dividends paid by Cripple Creek companies during the month amounts to $259,000. The Stratton executors have leased 180 acres of Bull hill properties, in blocks of 300 ft. square.

El Paso and Portland have been the features of the week, the two stocks, racing along together for high place, have made marked advances. El Paso has advanced from $2.03 to $2.30, and Portland from $2.03 to $2.49½ during the week. Elkton has remained about stationary, selling for 62½c. Findley has been pounded down and boosted back several times, but closed at 63c. Gold Sovereign is selling for 14½, Work for 14, United Gold Mines for 24, Golden Cycle for 60c. per share.

Salt Lake City. March 31.

There was considerably more life in the mining stock market this week, and some days trading was quite brisk. A wide fluctuation in some stocks has been noted. This was particularly true of May Day, which sold up to 29c., having advanced from 18½c. Altogether 78,200 shares were sold. Another Tintic stock, Little Chief, was an attraction and 55,200 shares came out at 3¼c.@4½c., brokers believing the chances were good for a scalp. The week ends wit'1 all Park City stocks weak.

After the announcement of plans for the future by the management of the Utah Copper Co. there was a lively interest taken in Utah Copper, some brokers bid up to $15 a share, but succeeded in jarring loose only a small quantity of the shares.

The dividends paid during the month of March aggregated $278,000; the Daly-West paying $108,000; Silver King, $100,000; Gemini, $50,000; Horn Silver, $20,000.

San Francisco. March 30.

In the early part of the week there was quite a rush in the Comstocks, but this was followed by a reaction, and at the close there was rather a weak tone, with a decreased volume of buying orders. Business in the Tonopah stocks on the old exchange was rather brisk.

Ophir sold at $7.25; Consolidated California & Virginia, $1.55; Mexican, $1.50; Hale & Norcross, 82c.; Sierra Nevada, 35c.; Gould & Curry, 18c. per share.

On the San Francisco & Tonopah exchange sales were rather active, and prices steady. Towards the close, however, business eased off considerably. Tonopah Midway brought $1.37@$1.42; Montana Tonopah, $3.05; Tonopah Belmont, $1.10; McNamara, 48@50c.; Original Bullfrog, 40c.; Tonopah Home, 23c. per share.

On the California exchange very little business was done, and stocks were dull. The principal business done was in Associated Oil certificates.

Monterey. March 28.

Notwithstanding the fall in silver, exchange on New York remains at 202.

In mining stocks Dos Estrellas brought $3,660; Luz de Borda, $13; Borda Antigua, $26; Barreno, $102; La Paz, $300; Reina Pachuca, $7; Amistad y Concordia, $75; San Francisco, $93, and Santa Gertrudi, $75.

Coal Trade Review.

NEW YORK, April 5.

ANTHRACITE.

The hard coal trade shows less activity than is usually expected at this season. Investigation among some of the leading operators fails to show any unusual demand for April deliveries, in spite of the advisability of laying in stocks against a probable disorganization of the trade a year from now. As a matter of fact, dealers in the North have always, in past years, stocked to the limit of their capacities on April prices, so that any greater demand this year can be met only by increased output, as to the possibility of which, it is too early in the month to predict. Shippers to the East laid heavy cargoes at their docks in anticipation of urgent inquiries, which actual shipments have failed to reveal. The all-rail trade, however, to this territory is about normal.

Steam sizes show no change in demand or in prices. Quotations, f. o. b. New York harbor shipping points, for the month of April, are as follows: Domestic sizes—broken, $4.25; egg, stove and chestnut, $4.50. Steam sizes—$3 for pea, $2.25@$2.50 for buckwheat, $1.45@$1.50 for rice and $1.30@$1.35 for barley.

BITUMINOUS.

The current market of the Atlantic seaboard soft coal trade seems to be easing off a little, as the improved car supply and the excellent condition of transportation permit free shipments, thus relieving urgent orders and clearing up the order books fairly well. Producers generally were able to complete their contracts before the end of the year, and the new season, opening April 1, has seen a fair supply of new orders on contracts in the hands of shippers. New contracts are being closed up daily by various companies without causing any public comment. Prices are well maintained, except in a few instances where outsiders have cut prices in fairly well-known territories, in order to take business from the channels in which it has usually gone. The labor question seems to be settled for the year by the action of the operators in the central Pennsylvania district in acceding to the miners' demand for the continuation of the 62c. rate for pick mining. This will undoubtedly give the men in the union territories less work, as competitors outside of these territories will secure more business. More attention is being given to anthracite, at the lower April prices, than to bituminous, at the yards, so that commission men can take advantage of the discount.

Trade in the far East is fair, and a good tonnage is going forward. Trade along the Sound is quiet, anthracite taking the

most attention. New York harbor trade seems to be quiet. Prices are quoted at $2.55@$2.60, f. o. b. harbor shipping points. All-rail trade is active. In this class of business some shifting around of contracts is apparent, and some of the lower grade coals show a slight cutting in price, in order to retain business. Transportation from mine to tide is excellent, better than schedule time having been reported. Car supply is well up to demand.

Coastwise vessel market shows that most of the sailing craft are out of winter quarters and that a fair tonnage is available at most of the ports. Some season contracts for transportation are reported as having been made at excellent rates. On these contracts and on single trip business discrimination is being shown by shipowners against those ports where much delay occurs in loading. On charters to such ports, the loading and discharging clause is demanded and received, whereas it is not required at other ports. Philadelphia quotes on large-sized vessels as follows: To Boston, Salem and Portland, 75c.; to the Sound, 60c.; to Lynn and Newburyport, 90c.; to Portsmouth and Bath, 75@80c.; to Gardner, 90c.@$1, and to Bangor, 90c., with towage charges at both these latter ports.

Birmingham. April 3.

The demand for coal in Alabama is still steady, and every effort is being made to maintain a good production at the mines. The commercial coal producers report their production increasing. At the furnace companies' mines, where the strike of the union miners has been on since last July, the production shows very little improvement over what it was a month ago. A large number of men were brought to this district to take the places of men who went out on strike, but during the past week quite a number of white men were furnished transportation back to their respective homes by the union mine workers. The Tennessee Coal, Iron & Railroad Co. has started up a few of the coke-ovens at Pratt City. There is still a large importation of coke to this State from West Virginia. There are no indications of a settlement of the differences, as far as can be learned.

Much headway is being made in the development of coal properties in Jefferson and Walker counties. The Gayosa Coal Co., a concern with 6,300 acres of coal lands in Walker county, of which L. B. Musgrove is president, has begun loading coal on railroad cars. One sidetrack has been placed to the mines and another is shortly to be completed.

Coal is being mined again at the Virginia mine, where the explosion took place on Feb. 20. The coke-ovens will be started in the next few days, and the coke will be used in the blast iron furnace at Gadsden. The coroner's jury is still investigating the accident.

Chicago. April 3.

Sales of anthracite for the last week have been fairly heavy, heavier, indeed, than most dealers anticipated a month ago. In nearly all Chicago territory orders for April delivery have been booked by traveling salesmen for the last two weeks. The prospects are that aggregate sales for the month will be much larger than the corresponding sales of a year ago, and retailers are making unusual efforts to induce buying at spring prices.

Indiana and Illinois brings $1.60@$2 for lump, $1.40@$1.60 for run-of-mine, and $1@$1.40 for screenings, on most business. April prices are lower by 10c. to 40c. on many grades than the prices of a year ago. Of eastern coals, smokeless is probably in the best condition, contracts being more generally made for this than for western bituminous. There is, however, a light demand for present deliveries, and the accumulation of track coal has forced the price of run-of-mine in some cases down to $2.65. On general sales smokeless is bringing $3@$3.25. Hocking also has suffered from too much on track, and has brought 20c.@30c. under the $3 standard price. Gas coals are not in present demand to any extent, but contracts are being made more freely.

Cleveland. April 4.

The feature of the coal trade is the contention for the lake business between the larger concerns. Buyers have been awaiting lower prices before covering their needs, and in that respect the season is backward. The low price made so far is $2.60 at the lake ports for the 3/4-in. steam coal which is shipped up the lakes. The possibilities are that steamer fuel coal will be on a proportionately low basis. Most of those in the trade expect a radical reduction before the season has ended. The buying of the consumers in the upper lake region will be belated on this account.

Steam coal conditions have not changed. There is a good demand and the market is strong, with consumption heavy. The price holds at $1@$1.10 at mines for both Ohio and Pennsylvania coals.

The coke situation is variable. There is an apprehension that the prices will be much stronger a little later on. The smaller ovens having coke for immediate shipment are asking $3.15@$3.25 at the oven for standard 72-hour coke, while the larger ovens are steady at $3. Off cokes are bringing a little below $3. There is a good demand from the furnaces also. Some of the ovens are now making contracts on the basis of $2.50 at oven for last half delivery.

Pittsburg. April 4.

Coal.—Preparations are being made for large shipments of coal to the lake ports, and lively competition is expected. Three Cleveland concerns—Pickands, Mather & Co., and the Hanna and Osborn interests—have placed contracts with independent operators in the Pittsburg district for coal for the lake trade, and the Pittsburg Coal Co. also has been a buyer of coal. Prices have not been definitely fixed, and it is reported that some serious cutting of last year's rates is contemplated. The Pittsburg Coal Co., according to an official statement made today, will put all of its mines in full operation next week, and has arranged for its railroad car requirements. River operators succeeded in sending out from 5,000,000 to 6,000,000 bush. of coal to down-river ports, and many of the towboats got back with large tows of empty coal boats and barges. The last shipment was made on Saturday. Prices remain about the same on a basis of $1@$1.10 for run-of-mine.

Connellsville Coke.— Prices are much firmer this week, furnace coke being quoted at $2.25@$2.50, the latter price being for standard Connellsville coke, and foundry at $2.75@$3.25. The production for the week was 262,908 tons, and the shipments were 12,157 cars, distributed as follows: To Pittsburg and river points, 4,657 cars; to points west of Pittsburg, 6,270 cars; to points east of Everson, 1,230 cars.

Foreign Coal Trade. April 5.

Exports of coal and coke from the United States for the two months ending February 28 are reported as below:

	1904.	1905.	Changes.
Anthracite	213,021	244,135	I. 31,114
Bituminous	610,723	775,306	I. 164,583
Total coal	823,744	1,019,441	I. 195,697
Coke	70,587	75,282	I. 4,695
Totals	894,331	1,094,723	I. 200,392

The coke went chiefly to Mexico, though some was also shipped to Canada. The coal exports were distributed as follows:

	1904.	1905.	Changes.
Canada	446,583	712,642	I. 266,059
Mexico	186,156	152,873	D. 33,283
Cuba	90,683	57,956	D. 32,727
Other West Indies	44,168	40,186	D. 3,982
France	4,558	95	D. 4,463
Italy	1,560	735	D. 825
Other Europe	9,289	3,189	D. 5,100
Other countries	41,747	51,765	I. 10,018
Totals	823,744	1,019,441	I. 195,697

Canada is naturally our largest customer. The exports to that country in detail were as follows:

	1904.	1905.	Changes.
Anthracite	204,459	239,419	I. 34,960
Bituminous	242,124	473,223	I. 231,099
Cotals	446,583	712,642	I. 266,059

Rail trade with Canada was less interrupted by the weather this year than was the case last year.

Imports of coal into the United States for the two months ending February 28 are reported as follows:

	1904.	1905.	Changes.
Canada	238,160	206,231	D. 31,929
Great Britain	24,274	15,392	D. 8,882
Other Europe	.....	110	I. 110
Japan	10,292	15,524	I. 5,232
Australia	48,796	15,745	D. 33,051
Other countries	311	37	D. 274
Totals	321,833	253,039	D. 68,794

Most of the imports from Canada were British Columbia coal, received at California ports. There was a large decrease this year in Australian coal, which also comes to California. Nearly all the Japanese coal is received at Manila.

Iron Trade Review.

NEW YORK, April 5.

Reports from the iron trade show continued activity in almost all directions. In raw material the United States Steel Corporation has placed additional contracts for bessemer pig, although it has practically all its furnaces in operation. Other sales of pig iron have been considerable for third-quarter delivery. Spot and nearby iron is scarce, and belated buyers are called upon for premiums. The same condition prevails with steel billets, which are hard to get for anything before July delivery.

Finished material is also in heavy demand. There has been a sharp increase in the call for structural material, especially from the large Eastern cities and from New England. The railroads, which have been large buyers for bridge and other work, are now calling for more rails, and there are prospects of a fair business in the rail mills—better than had been expected. There is talk also of some rail business for export, and negotiations are pending for some large orders for trolley work.

Imports of iron and steel, and of manufactures thereof, were valued as follows for February and the two months ending February 28:

	1904.	1905.	Changes.
February	$1,552,011	$1,703,073	I. $151,062
Two months	3,551,143	3,813,888	I. 262,745

Imports so far this year show a considerable increase. The chief items of these imports for the two months were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron	14,653	25,938	I. 11,285
Billets, blooms, etc.	3,379	4,172	I. 793
Scrap iron and steel	1,143	2,523	I. 1,380
Bars	3,487	5,320	I. 1,833
Rails	9,683	667	D. 9,016
Wire-rods	3,037	2,593	D. 444
Tin-plates	8,646	13 104	I. 4,458

Imports show an increasing tendency, which is most marked in tin plates. The imports of iron ore for the two months were 57,447 long tons in 1904, and 99,195 tons in 1904, an increase of 41,748 tons. Imports of manganese ore in February were 79 tons in 1904, and 10,600 tons in 1905.

Birmingham. April 3.

The market in the Southern territory continues steady, with a good demand, though in small lots, and quotations remaining firm.

The Tennessee Coal, Iron & Railroad Co. has started up No. 3 furnace at Bessemer, making two furnaces at that point manufacturing foundry iron. The Alabama Steel & Wire Co. expects to be able to blow in Gadsden furnace in the next week or so. The Tennessee Co. expects to start another Bessemer furnace by April 20. The Woodward Iron Co. will shortly blow in the new furnace at Woodward, but will blow out one of the old furnaces for repairs. The production during the month of April will be increased about 20%.

Intimation is still given that iron quotations are likely to advance in the near future. The following prices are given: No. 1 foundry, $14@$14.50; No. 2 foundry, $13.50@$14; No. 3 foundry, $13@$13.50; No. 4 foundry, $12.75@$13; gray forge, $12@$12.50; No. 1 soft, $14@$14.50; No. 2 soft, $13.50@$15.

The Tennessee Coal, Iron & Railroad Co. produced more steel at the Ensley plant during the past month than during any one month since the industry has been located here. The better portion of the steel manufactured went into rails. The Alabama Steel & Wire Co. continue to operate the steel plant at Gadsden, Ala., on basic iron, which was stored on the yards during the past six months. The rod, wire and nail mills at Ensley are being provided with all the steel needed.

Chicago. April 3.

Buying of pig iron continues to be good, though there has been no increase in general business from the record of last week. Orders are still for small to medium lots—500 to 1,000 tons—with the users of large amounts making inquiries somewhat more freely. Southern, perhaps, has the advantage over Northern on new business, and one or two Southern representatives are said to be getting 25@50c. more than the standard price for Southern No. 2, $13.50, Birmingham, or $17.15, Chicago. Northern is, however, in steady demand for mixtures, and does not seem likely to weaken in price for much business below $17.50.

On some special orders Northern has sold slightly below this price, but selling agents of local furnaces profess to see all signs favorable for the future. It will be, they say, a strong market indefinitely, and the general condition of the iron business seems to warrant this prediction. The foundry business is undoubtedly increasing, and there is a heavy demand from manufacturers of agricultural implements for manufactured shapes. Structural material is in good demand and promises to be needed more and more each month.

Nearly all sales are for the third and fourth quarters of the year.

Coke is firm, but sales are not heavy, and any accumulation of shipments would demoralize the market. Connellsville 72-hour brings $5.65, and standard grades of foundry 25@50c. less.

Cleveland, April 4.

Iron Ore.—Labor conditions have been cleared up considerably during the past week. It now seems out of the question that there shall be any labor difficulties on the lakes. Ice conditions are more satisfactory, and the prospects are that the season of navigation will be opened about April 10. Many shippers of ore are beginning to inquire for boats to load at the upper lake ports immediately. The wild rates have not been established as yet, but the possibilities are that the contract rates will rule on wild shipments. These rates are 75c. from the head of the lakes, 70c. from Marquette and 60c. from Escanaba. Sales are light and prices are holding about as they were, at $3.75 for bessemer Old Range, $3.50 for bessemer Mesabi, $3.25 for non-bessemer Old Range and $3 for non-bessemer Mesabi.

Pig Iron.—Buying of foundry iron for immediate shipment is light because foundries have covered their needs. Most of them are now buying for second half. Prices hold about as they have been, at $16 in the Valleys for No. 2 as a basis. There is some buying of Southern iron in this territory at $13.50, Birmingham, to which is added the $3.85 freight rate to make up the Cleveland price. There is but little buying of bessemer. Basic is in good demand, but short supply. The market for both commodities is steady at $15.50 in the Valleys.

Finished Iron and Steel.—With all of the mills the question of deliveries is the principal one. The buyers are so much in need of material that they are compelled to go to the smaller mills and the jobbers to piece out, paying premiums for what they get.

New York. April 5.

The iron trade continues active, local demand being good, while there is considerable trade coming here from New England.

Pig Iron.—New business continues to come in in moderate-sized orders generally. There is still some call for spot iron, but this is hard to get, except from second hands, and at an advance for quoted prices.

Prices are unchanged. For Northern iron we quote as follows for large lots: No. 1X foundry, $17.75@$18; No. 2X, $17.50@$17.75; No. 2 plain, $16.75@$17; gray forge, $16@$16.25. Some Virginia foundry No. 2 has been sold at $17.65@$17.90, while Virginia basic brings $17.15@$17.65. Southern iron is firmly held, and we quote for large lots on dock as follows: No. 1 foundry, $17.75@$18; No. 2, $17.25@$17.50; No. 3, $16.75@$17; No. 4, $16.25@$16.50; No. 1 soft, $17.75@$18; No. 2 soft, $17.25@$17.50; gray forge, $16.25@$16.50.

Dealing in warrants on the Produce Exchange continues rather low. There has been no material change in prices quoted.

Bars.—Bar iron continues steady and in good demand, quotations for large lots being 1.745@1.845c. Steel bars are quoted at 1.645c. Store trade is good, and prices are 2@2.25c. delivered.

Plates.—The demand for plate is still good. Tank plates are 1.745@1.845c.; flange and boiler, 1.845@1.945c.; universal and sheared plates are 1.645c. up, according to size.

Structural Material.—Structural material is called for, chiefly in lots of moderate size. Beams under 15 in. are 1.745c. in large lots; over 15 in., 1.845c.; angles are 1.745c. Extra prices are charged for small lots.

Steel Rails.—The regular quotation continues $28 per ton at mill for standard sections. Very little business is done in this market. Light rails continue in fair demand, prices varying from $23 for 35-lb. sections up to $28 for 12-lb. rails.

Old Material.—Scrap of all kinds is in good demand, and prices are firm. Railroad wrought is quoted $20@$21; best yard wrought, $17@$18; heavy steel melting scrap, $16@$17; machinery cast, $14@$15. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. April 4.

The upward trend of pig iron prices has frightened a good many possible buyers out of the market. In the present condition of things it will be necessary to offer some inducements to bring about large sales for late delivery. The amount of business being done for spot or early delivery has fallen to insignificant proportions among the smaller consumers. On the other hand, there are pending transactions for large lots of basic iron, the outcome of which depends upon influences centered around the furnaces. Interest has been suddenly developed in possibilities of obtaining foreign iron and the arrival of some lots recently has been something in the nature of a surprise. The reported purchase of 25,000 tons of Middlesborough iron is a significant move. Efforts to obtain Alabama iron have not resulted satisfactorily, although some business has been done for No. 12 on a basis of $13.50. Quotations today are, for No. 1, $18.50; No. 2, $18; No. 2 plain, $17.50; standard forge, $16.50; basic, $17.

Steel Billets.—There have been no interesting developments in steel billets, and as high as $30 has been paid by urgent buyers. The average quotation in a large way is $28.50.

Merchant Bar.—A great deal of business is coming to the stores from retail sources and consumption is on the increase.

Structural Material.—The demand for structural material has suddenly assumed very large proportions. There are contracts now pending in New York and New England centers for some 50,000 tons of material; there are also large contracts pending in Western cities, and the expectation is that some of these contracts will be placed this week. Prices are very strong for delivery any time before June 30.

Steel Rails.—Orders for steel rails are dropping in steadily. There are inquiries for rails for export and there are negotiations pending for girders and for rails for trolley lines.

Scrap.—Buyers of scrap are inclined to higgle over prices, and holders are occupying a defiant position. Best railroad scrap is selling at $23.50; No. 1 steel scrap, $18; old iron rails are quoted at $26 per ton.

Pittsburg. April 4.

After negotiations pending for over a week, the United States Steel Corporation has closed contracts for 35,000 tons of bessemer pig iron for April delivery. It had been expected to buy for the quarter, but for some reason is still following the policy of buying monthly. Of the tonnage just placed, 25,000 tons will be furnished by the Bessemer Pig Iron Association and the rest is divided among independent interests. The price paid was $15.50, Valley furnace, but it is reported that one small lot was obtained at $15.40. Other sales of pig iron during the week were confined to small lots, and aggregate about 15,000 tons of all grades. The corporation is operating 98% of its blast furnace capacity, and all of the furnaces of the Carnegie Steel Co. are running, and on a number of occasions records of production have been broken. The company has been a heavy buyer of ferro-manganese, having put the furnace devoted to that metal on pig iron, and as a result, also on account of the difficulty in obtaining manganese ore, prices have been advancing rapidly and 80% domestic is quoted today at $51 a ton. It is predicted that the price will go up to $60, and probably to $75 a ton. A contract for bessemer pig iron was made by the Allegheny Steel & Iron Co. and calls for 4,500 tons. The price was $15.55, Valley furnace. The company has just completed an acid open-hearth furnace, for which the iron is intended. It has been operating two basic open-hearth furnaces, and the product is billets and sheet bars. The company is out of the market for the present, having sold up for several weeks ahead. Several lots of foundry iron of from 600 to 3,000 tons have been sold for delivery in the second half to consumers who have covered up to July 1. It is reported that one sale was made at $15.75, Valley furnace, which is 25c. under the prevailing quotations. Several small lots for prompt delivery were sold at $16.25, Valley.

The demand for steel continues very heavy, and every effort is being made to get the greatest possible production. The world's record of production has been broken at the Clairton works of the Carnegie Steel Co. for a plant of that size, twelve 50-ton open-hearth furnaces. In the four weeks ending Saturday 42,300 tons of steel ingots were produced. Another surprising record was made by the American Sheet & Tin Plate Co. Last month it produced 50,000 tons of sheets and a like tonnage of tin plate, equal to 1,000,000 boxes. This is at the rate of 12,000,000 boxes of tin plate a year and more than the entire production of the country for 1904. In 1903 there were 10,750,000 boxes made, and the production for last year in the absence of official data is estimated at 11,200,000 boxes. The independent plants also were busy, and as they produce about one-fourth the tonnage turned out by the American, tin-plate production now is at the rate of 15,000,000 boxes a year. Of course, it is not expected that this will be continued, but it is almost certain that the mills will be kept busy, as it is admitted by the American Co. that it has temporarily dropped the rebate trade, owing to the big demand for domestic consumption. The rebate trade is not so profitable, and is only taken to keep the mills going. Outside of sheets and tin plate but little new business has been received during the week, but specifications in all finished lines have been very heavy. Structural business is coming in more satisfactorily, but the orders are small ones, running from 400 to 1,000 tons. The American Bridge Co. booked about 20,000 tons in the week. Although the rail business is slow compared with former years, some large orders have been placed by Western roads, and the Chicago mill is filled up to Nov. 1. As a result, about 30,000 tons of rail orders from the West have come to Pittsburg. The standard price of rails is quoted f. o. b. mill when the mill can ship, but owing to the condition at the Chicago mill, the rails for Western delivery are quoted at $28 f. o. b. Pittsburg.

The United States Steel Corporation did not authorize a general advance in wages on April 1 for its 147,000 employees, as had been expected. Instead, an announcement was made that wages in some departments would be adjusted. No official notice as to the amount or the number of men benefited was given. It was learned, however, that not more than 50% of the employees will be affected, and that the advance will not average more than 10% and likely will not exceed $4,000,000 for the year. The men who will participate in the advance are the lowest-paid employees in various departments, and are principally the laborers and blast-furnace workers. It is believed that later on there will be a general re-adjustment, but probably it will not be made until after the wage scale has been formulated at the annual convention of the Amalgamated Association, which will open in Detroit on May 2.

Pig Iron.—The total sales of pig iron in addition to the transaction of the United States Steel Corporation, aggregate about 15,000 tons. Bessemer is quoted at $15.50 @$16, Valley furnace; foundry No. 2 at $16.85@$17, Pittsburg, and gray forge at $15.85@$16, Pittsburg.

Steel.—There is still a great scarcity of crude steel, and bessemer and open-hearth billets have sold during the week at $26@ $26.50, with sheet bars $1 a ton higher. Specifications for merchant bars have been heavy, and the market is firm at 1.50c. Plates are quoted at 1.60c.

Sheets.—Mills are behind in deliveries and are not able to meet new specifications. The demand for galvanized sheets is greater than for black sheets. No. 28 gauge black sheets are quoted at 2.40c. and galvanized at 3.45c.

Ferro-Manganese.—The price of both domestic and foreign 80% has advanced to $51, and is expected to go to $60 or higher. The Carnegie Steel Co. has been a heavy buyer.

Chemicals and Minerals.

NEW YORK, April 6.

Spring-like weather has stimulated buying, and firm prices for heavy chemicals suggest further improvement in business generally. Foreign makers, by agreement, have advanced the price of sal soda from 67.5c. to 85c. per 100 lb., f. o. b. New York, smaller exports to this country notwithstanding. Domestic makers will, of course, follow suit.

An innovation in the propaganda work of the German Kali Syndicate is the publication for the benefit of its agents of a monthly newspaper, *Die Ernährung der Pflanze*. The data published tell what is being done in the various fertilizer materials, and, coupled with the beautifully illustrated pamphlets on potash salts, distributed among consumers, makes a collection of valuable literature on the nourishment of plants. The first issue of the Kali Syndicate's journal is dated Feb. 15, 1905, and is well edited.

Copper Sulphate.—Comparatively little business has been influenced by the reduction in prices to $4.75@$5 per 100 lb. at New York.

Exports of copper sulphate from the United States in February were 4,927,967 lb., making for the two months this year a total of 6,775,941 lb., principally for Austria, France and Argentina. Compared to the corresponding two months last year there is shown a decrease of 2,467,162 lb., or 26.7%. The average invoice value of this year's exports was $4.59 per 100 lb., as against $4.72 in 1904, showing a decrease of 13c. per 100 lb., which on the much smaller purchases suggests that so far 1905 has been rather unprofitable for the export trade. It is worthy of remark that domestic deliveries have yielded nearly 13% more than export.

Acids.—Quiet and unchanged in price.

Nitric acid, 36°, 100 lb.	$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5 50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk, ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66° bulk, ton	21.00@23.00

Sulphur and Pyrite.—Large arrivals of domestic brimstone are expected at North Atlantic ports (about 7,700 tons in addition to the 2,300 tons in port). Quotations are $21.25 for prime, and $20.95 for 'seconds' at New York and Portland, Me. At Philadelphia or Baltimore quotations are 15c. per ton higher than at New York or Portland, Me. Foreign best unmixed seconds are nominal at $21.25. Pyrite shows a moderate business at the following prices: Imported lump ore, 44@52% sulphur, 10c. @11c. per unit, and fines, 9.5c.@10c. Domestic lump ore, 42@44% sulphur, 9.5c.@ 10c. per unit, and fines, 8.5c.@9c. per unit.

Imports of brimstone and pyrite into the United States in the two months ending February 28, in long tons, were:

	1904.	1905.	Changes.
Brimstone	15,603	17,154	I. 1,551
Pyrite	57,366	91,258	I.33,892
Sulphur content, both...	43,139	60,958	I.17,819

Apparently there has been expansion in imports this year, suggesting an increase of over 41% in the domestic consumption. Nearly all the brimstone received was from Sicily direct, while the pyrite came from Spain and Canada.

Nitrate of Soda.—Market conditions are firmer, and prices are advancing, primarily because the European consumption shows improvement, there being an increase of 68,000 tons in the March deliveries, as compared with last year. Importers at New York are asking $2.20 per 100 lb. for 95%, and $2.30 for 96%, July shipment; spot 96%, $2.50; April arrival, $2.45, and May and June, $2.35.

Messrs. Mortimer & Wisner's monthly statement of nitrate of soda, dated New York, April 1, gives the following interesting statistics, in long tons:

	1904.	1905.
Imported into Atlantic Ports from West Coast from Jan. 1, 1905, to date	81,161	50,100
Stock in store and afloat April 1, in New York	1,900	3,500
Philadelphia	5,000	.....
Baltimore	300	.....
Charleston	2,400	.....
To arrive, due July 15, 1905	62,300	100,000
Visible supply to July 15, 1905	71,900	103,500
Stock on hand Jan. 1, 1905	8,100	8,380
Deliveries past month	27,201	9,530
Deliveries since Jan. 1 to date.	79,661	54,980
Total yearly deliveries.	239,684	.....
Prices current, April 1	2.17½c.	2.45c.

Quotations are for 96%; 95% can be had at 2½@5c. per 100 lb. cheaper.

Imports of nitrate of soda into the United States in February amounted to 26,510 long tons, making for the two months this year 47,608 tons, against 59,235 tons in 1904; showing a decrease of 11,627 tons, or nearly 20%. This reduction is partly due to the delay in arrivals, and also to smaller deliveries to Southern fertilizer manufacturers, who anticipate curtailed cotton planting this year.

Sulphate of Ammonia.—Quiet at $3.15@$3.17 per 100 lb. for good gas liquor, according to shipment.

Phosphates.—The strong point in the market is the price-schedule. Another 25c. per ton has been added to South Carolina rock, partly because of the improved demand and limited production. Export trade is quiet.

In February the United States exported 59,192 long tons of phosphates, principally from Florida and Tennessee for Germany, Italy, France and Great Britain. For the two months this year the shipments totaled 104,268 tons, which, compared to 118,066 tons in the corresponding period last year, shows a decrease of 13,798 tons, or over 11%. Prices abroad during the two months this year varied from $10.67@$11.85 per long ton, for Florida high-grade rock; $7.70@$8.40 for Florida land pebble; $10.27@$10.67 for Tennessee rock, and $6.38@$6.67 for South Carolina rock, c. i. f. United Kingdom or Continental ports.

Imports of phosphatic material from Belgium, Canada, the West Indies, etc., amounted in February to 5,987 tons, making for the two months 24,170 tons, valued at $151,529. In the corresponding two months last year the imports totaled 20,260 tons, valued at $99,988. The increase in quantity this year is 3,910 tons, and in value, $51,541.

The foreign movement of chemical manures in Germany in the full year 1904, in metric tons, was:

	Imports.	Exports.
Basic slag	150,836	258,767
Guano, natural	32,186	952
Guano, artificial	25,262	1,479
Nitrate of soda	506,172	21,075
Superphosphate	91,288	129,925
otals	805,744	412,198

Compared to 1903 increases shown in imports in 1904 were 18,499 tons basic slag; 39,042 tons nitrate of soda, and 8,548 tons superphosphate; decreases were 67 tons natural guano, and 6,787 tons artificial guano. Increases shown in this year's exports were 42,576 tons basic slag; 125 tons natural guano; 279 tons artificial manure, 3,492 tons nitrate of soda, and 30,253 tons superphosphate. The imports were principally from Belgium, France and Chile; exports mostly to Austria-Hungary, Belgium, Holland, Denmark, Italy and Switzerland.

Phosphates.	F. o. b.	C. I. F. Gt. Britain or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4 00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.50@3 75	.....
river rock	3.25@3.50	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr	.....	11.39
Basic slag, 42@50%	.....	10.21@10.44
38@45%	.....	9.48@ 9.72
30@35%	.....	7.78@ 7.90

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡ On vessel Ashley River, S. C.

Metal Market.

New York, April 5.

Gold and Silver Exports and Imports.

At all United States Ports in February and Year.

Metal.	February.		Year.	
	1904.	1905.	1904.	1905.
G'ld Exp	$732,614	$14,794,312	$1,324,181	$31,621 480
Imp	5,034,372	2,190,980	13,259,880	4,086,671
Exc	I. $4,301,758	E$12,603,332	I.$11,935,699	E$27,535,809
Silv Exp	3,940,577	4,036,075	8,927,471	8,400,820
Imp	2,106,675	2,063,293	4,716,047	3,985,495
Exc	E. $1,833,902	E. $1,972,782	E.$4,211,424	E. $4,415,335

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending April 1 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$728,199	$779,561	527,200	48,101
1905	31,935,270	3,974,111	9,335,041	677,437
1904	1,927,160	1,533,704	12,202,640	177,530
1903	1,291,151	2,500,879	5,314,800	336,197

Gold exports were mostly to the West Indies; imports chiefly from France and Great Britain. Silver exports were principally to London; imports from Central America and Mexico.

General business continues in good condition. Activity is manifest in almost all trades.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending April 1 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts	$1,022,707,100	$1,099,289,700
Deposits	1,069,369,400	1,138,661,300
Circulation	36,880,000	43,718,700
Specie	223,390,100	209,481,100
Legal tenders	71,707,300	83,848,800
Total reserve	$295,097,400	$293,329,900
Legal requirements	267,342,350	284,665,325
Balance surplus	$27,755,050	$8,664,575

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York	$209,481,100	.....
England	198,769,570	.....
France	553,055,040	$220,113,540
Germany	214,745,000	71,585,000
Spain	74,580,000	104,480,000
Netherlands	30,068,500	31,573,500
Belgium	16,270,000	8,135,000
Italy	111,530,000	161,919,500
Russia	502,475,000	31,910,000
Austria	240,905,000	65,040,000

The returns of the Associated Banks of New York are of date April 1 and the others March 30, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market in India has been quiet, and no special orders are in sight. The tendency is towards steadiness, at current figures.

The United States Assay Office in New York reports receipts of 51,000 oz. of silver for the week.

Shipments of silver from London to the East for the year up to March 23 are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India	£3,238,839	£1,956,287	D. £1,282,552
China	71,000	1,370	D. 69,630
Straits	58,103	2,800	D. 55,303
Totals	£3,367,942	£1,960,457	D. £1,407,485

Receipts for the week were £165,000 in bar silver from New York, £29,000 from the West Indies, and £5,000 from Australia; total, £199,000. Shipments were £161,100 in bar silver to India.

Indian exchange has been easier, the demand for money in India having fallen off. The Council bills offered in London were taken at an average of 16.03d. per rupee. Buying of silver for the bazars has been light.

The Treasury Department's estimate of the amount and kinds of money in the United States on April 1 is as follows:

	In Treasury.	In circulation.
Gold coin, inc. bullion		
Treasury	$175,361,031	$644,726,546
Gold certificates	45,870,650	472,316,319
Silver dollars	16,075,788	73,831,773
Silver certificates	5,883,424	462,430,576
Subsidiary silver	13,915,168	99,755,170
Treasury notes of 1890	63,224	10,047,776
U. S. notes	14,616,143	332,064,873
Currency certificates	.....	.....
Nat. bank notes	12,128,995	463,819,950
Totals	$283,914,423	$2,558,992,983

Population of the United States April 1, 1905, estimated at 82,910,000; circulation per capita, $30.86. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasurer of the United States, and amounting to $81,042,369. The amount in circulation shows a decrease of $1,621,729 from March 1, but an increase of $42,353,760 over April 1, 1904.

The coinage executed at the mints of the United States in March is reported by the Bureau of the Mint, Treasury Department, as below:

Denomination.	Pieces.	Value.
Double eagles	187,046	$3,740,920.00
Eagles	46	460.00
Half eagles	254,750	1,273,750.00
Quarter eagles	71	177.50
Lewis & Clarke Exp. dol.	10,013	10,013.00
Total gold	451,926	$5,025,320.50
Half dollars	72,325	36,162.50
Quarter dollars	912,325	228,081.25
Dimes	2,360,325	236,032.50
Total silver	3,344,975	$500,276.25
Five c., nickels	4,714,000	235,700.00
One c., bronze	9,340,000	93,400.00
Total minor	14,054,000	$329,100.00
Total coinage	17,850,901	$5,854,696.75

There was also coined for the Philippines: Pesos, 186,201; 50c., 852,201; 20c., 120,201; 10c., 201; 5c. 200; 1c., 3,780,200; 0.05c., 200; total pieces, 4,939,404.

Prices of Foreign Coins.

	Bid.	Asked
Mexican dollars	$0.43½	$0.47
Peruvian soles and Chilean pesos	.40	44
Victoria sovereigns	4.85	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

March-April	Copper. Lake, Cts. per lb.	Copper. Electrolytic Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
30	15⅛ @15⅜	15 @15⅛	67⅛	30⅛	4.50	5.85	5.70
31	15⅛ @15⅜	15 @15⅛	67½	30¼	4.50	5.85	5.70
1	15⅛ @15½	15 @15⅛	.....	30¼	4.50	5.85	5.70
3	15 @15⅛	14⅞ @15⅛	67½	30½	4.50	5.85	5.70
4	15 @15⅛	14⅞ @15⅛	67	30½	4.50	5.85	5.70
5	15 @15⅛	14⅞ @15⅜	67½	30⅜	4.50	5.85	5.70

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic copper.

SILVER AND STERLING EXCHANGE.

March-April.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	April.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
30	4.85⅞	56⅛	26 1/16	3	4.85⅞	56	25 7/16
31	4.85⅞	55⅞	25 13/16	4	4.85⅞	55	25⅜
1	4.85⅞	55⅞	25⅜	5	4.859	55⅞	25 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Copper.—The market has ruled very quiet indeed. Consumers placed no orders, and a further damper was occasioned through the irregularity of the standard market. Some small speculative lots which were forced on the market had a disproportionate influence, owing to the absence of demand. The closing quotations are somewhat lower, at 15@15¼ for Lake copper; 14⅞@15⅛ for electrolytic, in ingots, cakes and wirebars; 14⅝@14⅞ in cathodes; 14½@14¾ for casting copper.

As stated above, there has been a great deal of irregularity in the standard market in London, which at one time touched £66 15s. for spot, but the closing quotations on Wednesday show a recovery, being cabled as £67 2s. 6d. for spot, £67 10s. for three months.

Statistics for the second half of March show a decrease in the visible supplies of 400 tons.

Refined and manufactured sorts we quote: English tough, £70 10s.@£71; best selected, £71 15s.@£72 5s.; strong sheets, £79 10s.; India sheets, £75 10s.; yellow metal, 6⅝d.

Exports of copper from New York and Baltimore for the week of April 4 were 6,476 long tons. Imports for the week of March 31 were 67 tons copper and $21,600 worth of ore (quantity not given).

Copper Exports and Imports.—Exports of copper from the United States in the two months ending February 28 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor; the figures given being in long tons, of 2,240 lb. each:

	1904.	1905.
Copper	47,301	39,332
Copper ores	4,488	4,668

The copper contents of ore are not given. Estimating them, chiefly on the basis of values, we find that the total exports of material this year were equal to 40,176 tons of fine copper. The decrease in exports this year was wholly in January; the February exports showed an increase over last year of 1,030 tons. The exports to China for the two months were 4,595 tons.

Imports of copper and copper material into the United States for the two months ending February 28, with re-exports of foreign material, were as follows; the figures giving the equivalents of all material in long tons of fine copper:

	Metal.	In ores, etc.	Total.
Mexico	7,641	1,641	9,282
Canada	1,732	776	2,508
Great Britain	1,553	.....	1,553
Other countries	331	136	467
Total imports	11,257	2,553	13,810
Re-exports	50	.....	50
Net imports	11,207	2,553	13,760

In the two months of 1904 the equivalent copper in ports were 13,328 tons, showing an increase of 482 tons this year. The net imports were less than the exports given above by 26,416 tons. The tonnage of ore and matte from Mexico this year was 11,845 tons, carrying 1,641 tons copper; from Canada, 22,366 tons, carrying 776 tons of copper.

Tin.—The hand-to-mouth policy of buying, which has lately been the feature of the market, has continued throughout the week. The present high prices for spot are viewed by consumers with a great deal of suspicion. The backwardation is even more outspoken than when we last went to press. Quotations at the close are 30@30¼ for spot, 29½@29⅝ for futures.

The London market, which closed last week at £138 7s. 6d. for spot, £134 7s. 6d. for three months, opened on Monday at £139 10s. for spot, £134 15s. for three months. At the close on Wednesday the market shows some irregularity, the quotations being cabled as £139 5s. for spot, £134 10s. for three months.

Statistics for the month of March show an increase in the visible supplies of 300 tons.

Imports of tin into the United States for the two months ending February 28 are reported as below, the figures given being long tons, of 2,240 lb.:

	1904.	1905.	Changes.
Straits	2,185	2,996	I. 811
Australia	75	15	D. 60
Great Britain	2,088	3,908	I. 1,820
Holland	173	105	D. 68
Other Europe	110	115	I. 5
Other countries	1	50	I. 49
Total	4,632	7,189	I. 2,557

The large increase this year indicates a gain in consumption, as no considerable stocks have accumulated. The tin received from British ports is chiefly Straits tin.

Lead.—There has been an active business, brought about by the very large consumption of all kinds of lead manufactures. The closing quotations are unchanged, at 4.42½, St. Louis, 4.50, New York.

The demand from abroad continues at an increased rate, the closing quotations being cabled at £12 11s. 3d. for Spanish lead, £12 13s. 9d. for English lead.

Imports of lead into the United States for the two months ending February 28, with re-exports of imported lead, are given by the Bureau of Statistics as follows, the figures being in short tons:

	1904.	1905.	Changes.
Lead, metallic	2,360	1,607	D. 753
Zead in ore and base bullion	16,290	18,058	I. 1,768
Total imports	18,650	19,665	I. 1,015
Re-exports	12,505	5,316	D. 7,189
Net imports	6,145	14,349	I. 8,204

Of the lead imported this year 16,208 tons were from Mexico and 3,070 tons from Canada, the balance from other countries. Receipts from Canada, which were 384 tons in January, amounted to 2,686 tons in February of this year, against 383 tons in 1903. Exports of domestic lead were only 12 tons in 1904, and 19 tons this year. Re-exports have been unusually light this year.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is firm and a shade higher. Refined Missouri brands are selling as high as 4.52½c. per pound.

Spelter.—Some very large orders have been placed during the last few days, checking the decline. Consumers allowed their stocks to run down to the lowest possible limit, and since consumption has right along been very good, a recovery in prices is looked for. The closing quotations are firm, at 5.70, St. Louis, 5.85, New York.

The foreign market has been quiet and practically unchanged. The quotation for good ordinaries is cabled as £23 12s. 6d., and for specials as £23 17s. 6d.

Exports of spelter from the United States for the two months ending February 28 were 237 short tons in 1904, and 1,237 tons in 1905, an increase of 1,000 tons. Exports of zinc ore were 4,558 tons in 1904 and 3,554 tons in 1905, a decrease of 1004 tons this year.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is strong and advancing. The latest sales are on a basis of 5.82½@5.85c., East St. Louis, with more buyers than sellers.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 18, that local prices are somewhat lower, but mine-owners are generally holding for an improvement. Blende, 35%, is quoted at 74fr., and calamine, 30% zinc, at 54fr. per ton. Shipments for the week were 1,065 tons calamine and 3,180 tons blende to Antwerp; 2,000 tons blende to Stettin.

***Antimony.*—The market is firmer,** and sales have been made of the common brands at 8c. per pound.

Nickel.—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots is higher, according to quantity, running up to 60c. for small orders.

Exports of nickel, nickel oxide and nickel matte from the United States for the two months ending February 28 were 148,083 lb. in 1904, and 1,036,995 lb. in 1905, an increase of 888,912 lb. Imports of nickel ore and matte were 1,581 tons in 1904, and 1,992 tons in 1905, an increase of 411 tons this year.

Platinum.—Quotations are firm at $20.50 per oz. Gas engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

Quicksilver.—Quicksilver is easy at $38 @$38.50 per flask in large lots, while $40 is the price for smaller orders. San Francisco prices are $37.50@$38 per flask for domestic orders, with some discount for export. The London price is lower, at £7 12s. 6d., with the same figures quoted by second hands.

Exports of quicksilver from the United States for the two months ending February 28 were 482,655 lb. in 1904, and 135,135 lb. in 1905, a decrease of 347,520 lb. this year.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

Minor Metals and Alloys.—Thallium is quoted at 60@65 marks per kg. at Breslau, Germany. Manganese metal is quoted at 360 marks per 100 kg., f. o. b. Bremen, Germany. Manganese tin alloy, 55%, is quoted 365 marks per 100 kg. for first quality, and 225 marks for second quality, both f. o. b. Bremen.

For other minor metals and their alloys, wholesale prices are, f. o. b works:

	Per lb.
Aluminum.	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@99% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$2.75
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Missouri Ore Market.

JOPLIN, April 1.

The highest price paid for zinc ore was $45 per ton, and the assay price was quoted at $42 per ton of 60% zinc, with some medium grades as low as $40 and a few bins of low-grade ore selling on a $38 basis. Lead continues strong at $58 per ton, and the purchases were unusually large, the week averaging with the largest shipments of any one week.

It has developed that the movement on the part of the producers, which two weeks ago seemed to indicate an abrupt breaking off in the decline of prices, was aimed to stop the decline on a basis of $40 per ton of 60% zinc, and, judging from the talk of several of the best informed purchasing agents, the smelters are willing to do all in their power to hold the metal market on a plane that will enable them to keep the best grades of ore on a basis of $40. Arriving at this seeming understanding, the producers will gradually restrict the output by closing down a few mills each week, curtailing the production of April approximately 1,500 tons. It is now believed this arrangement will suffice to maintain satisfactory prices for three months, when a natural advance in prices to a $45 basis is anticipated.

Following are the shipments of zinc and lead from the various camps of the district for the week:

	Zinc. lb.	Lead lb.	Value.
Joplin	2,819,290	425,870	$74,370
Carterville and Webb City	2,520,710	731,310	71,620
Duenweg	1,601,690	285,460	41,910
Galena-Empire	972,180	105,110	27,370
Aurora	1,163,880	.....	20,220
Carthage	471,900	.....	9,440
Prosperity	215,900	91,180	7,170
Neck City	315,230	.....	6,940
Granby	435,000	50,000	6,200
Alba	297,280	1,220	6,130
Badger	185,270	11,940	4,330
Zincite	191,350	2,490	4,090
Central City	144,680	1,500	3,660
Beef Branch	195,480	51,210	3,090
Oronogo	98,420	19,550	2,570
Reeds	103,420	.....	2,070
Sherwood	74,740	.....	1,580
Springs City	77,860	.....	700
Totals	11,884,480	1.776,890	$293,460
Total sales this year	113,885,470	13,703,040	$3,164,975

Zinc value, the week, $242,150; thirteen weeks, $2,767,540. Lead value, this week, $51,290; thirteen weeks, $397.415.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.055	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	.....	24.974	.....
May	55.430	.....	25.578	.....
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12 410	15.008	12.553	15.128
February	12.063	15.011	12.245	15.136
March	12.299	15.125	12.551	15.150
April	12.923	.....	13.120	.....
May	12.758	.....	13.000	.....
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	57.500	68.262	July	57.256	.....
Feb	56.500	67.963	August	56.952	.....
March	57.321	68.174	Sept	57.645	.....
April	58.247	.....	Oct	60.012	.....
May	57.321	.....	Nov	65.085	.....
June	56.398	.....	Dec	66.384	.....
			Av., year	58.857	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	28.845	29.325	July	26.573	.....
Feb	28.087	29.262	August	27.012	.....
March	28.317	29.523	Sept	27.780	.....
April	28.132	.....	Oct	28.596	.....
May	27.718	.....	Nov	29.185	.....
June	26.325	.....	Dec	29.286	.....
			Av., year	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	4.347	4.552	July	4.192	.....
Feb	4.375	4.450	August	4.111	.....
March	4.475	4.470	Sept	4.200	.....
April	4.475	.....	Oct	4.200	.....
May	4.423	.....	Nov	4.200	.....
June	4.496	.....	Dec	4.600	.....
			Av., year	4.309	.....

SPELTER.

Month.	New York.		St. Louis.	
	1904.	1905.	1904	1905.
January	4.863	6.190	4.673	6.032
February	4.916	6.139	4.717	5.989
March	5.057	6.067	4.841	5.917
April	5.219	.....	5.038	.....
May	5.031	.....	4.853	.....
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
ecember	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

Dividends.

Company.	Payable.	Rate.	Amount.
‡Am. Agri. Chem., pf	Apr. 1	$.30	$544,050
†Am. Sm. & Ref., com.	Apr. 15	1.25	625,000
†Am. Sm. & Ref., pf.	Apr. 1	1.75	875,000
*Annie Laurie, Utah	Mar. 25	.50	12,500
†Boston & Oroville, Cal.	Apr. 1	.25	125,000
†Calumet & Hecla	Mar. 23	15.00	1,500,000
†Central Coal & C., com.	Apr. 15	1.50	76,875
†Central Coal & C., pf.	Apr. 15	1.25	23,438
*Central Lead Mo	Mar. 28	.50	28,000
*Central Eureka, Cal.	Apr. 8	.07	5,000
*Claremont Oil, Cal.	Apr. 1	.01	4,500
†Cop. Range Con., Mich.	Apr. 1	1.00	383,781
Cripple Creek Con	Mar. 25	.005	10,000
†General Chemical, pf	Apr. 1	1.50	150,000
†Gemini-Keystone	Mar. 25	10.00	50,000
†Guggenheim Expl.	Apr. 1	1.75	183,750
Homestake S. D.	Mar. 25	.50	109,200
Horn Silver, Utah	Mar. 31	.05	20,000
*Lightner, Cal.	Mar. 20	.05	5,113
*Mines Co. of Am.	Mar. 20	.01½	30,000
*National Lead, pf.	Mar. 15	1.75	260,820
New Central Coal, Md.	May 1	.40	20,000
*New Century Zinc.	Apr. 1	.01	1,500
‡New Haven I. & St.	Apr. 6	.15	15,000
*N.Y. & Hond. Rosario	Mar. 25	.10	15,000
New Idria Quicksilver	Apr. 1	.30	30,000
*Oil City Petroleum	Apr. 15	.00½	2,500
*Pacific Coast Borax	Mar. 29	1.00	19,000
*Peerless Oil, Cal.	Apr. 1	.14	12,880
†Phila. Gas, com	May 1	.75	398,888
*Pocahontas Coll., pf.	Apr. 1	.50	7,500
*Santa Maria de la Paz.	Mar. 30	2.29	5,496
‡Sloss-Sheffield St. & I., c.	Apr. 3	2.50	187,500
†Sloss-Sheffield, pf.	Apr. 3	1.75	117,250
*Silver King, Utah	Mar. 25	.66⅔	100,000
†Standard Oil	Mar. 15	15.00	14,550,000
St. Eugene Con., B.C.	Mar. 15	.02	64,040
†Tenn. C. & I., com.	May 1	1.00	225 536
*Thirty-three Oil, Cal.	Apr. 6	.10	10,000
*Twenty-eight Oil, Cal.	Apr. 15	.15	9,000
*Union Oil, Cal.	Mar. 20	.50	26,336
†United (Cripple C'k)	Apr. 5	.00½	20,046
†United Gas Imp.	Apr. 15	2.00	180,000
*United Petroleum, Cal.	Mar. 20	.80	11,744
†Va.-Carolina Chem., pf.	Apr. 15	2.00	360.000
Westmoreland Coal.	Apr. 1	2.50	150,000
‡Wolverine, Mich.	Apr. 1	5.00	300,000

*Monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alta-Sierra, Cal.	Mar. 27	Apr. 17	.30
Caledonia, Nev.	Apr. 19	May 10	.10
Centennial Copper, Mich.	Apr. 10	.....	2.00
Centennial Copper, Mich.	Aug. 10	.....	2.00
Copper Butte, Utah	Mar. 30	.....	.00½
Emerald, Utah	May 14	June 10	.01½
Golden West, Cal.	Apr 17	May 13	.01
Halifax-Tonopah, Nev.	Mar. 6	Apr. 6	.10
Holland, Utah	Apr. 19	May 8	.04
Jenny Lind, Cal.	Apr. 9	.....	.01
Julia Con., Nev.	Mar. 28	Apr. 18	.03
Marina Marsicano	Mar. 29	Apr. 24	.10
Mexican, Nev.	Apr. 11	May 2	.15
New Montezuma, Cal.	Apr. 14	.....	.02
Republic, Cal.	May 3	.....	.02½
Reward, Cal.	Apr. 17	.....	.01½
Savage, Nev.	Apr. 7	Apr. 27	.10
Socrates Con., Cal.	May 1	.....	.02½
Soldan, Cal	Apr. 11	.....	.03
Spanish Ridge, Cal.	Apr. 13	.....	.05
Spider, Utah	Mar. 30	Apr. 15	.00½
Wabash, Utah	Mar. 27	Apr. 17	.05
Yellow Jacket, Nev	Apr. 11	May 16	.10

Colorado Springs (By Telegraph.)

Company.	April 3.		April 4.	
	H.	L.	H.	L.
Anaconda	.19½	.16	.18½	.17
C. K. & N.	.20	.15	.20	.15
Cripple Creek Con.	.11½	.10½	.10½	.10½
Doctor Jack Pot	.04½	.04½	.03½	.03½
Elkton	.60½	.60½	.59½	.59½
El Paso	2.34	2.33	2.08	2.06½
Isabella	.30	.29½	.29½	.29
Moon Anchor	.....	.....	.06½	.06
Old Gold	.08½	.....	.08½	.06½
Portland	2.50	2.35	2.15	2.10
Vindicator Con	.85½	.....	.86	.80
Work	.14½	.14½	.12½	.12½

STOCK QUOTATIONS.

Salt Lake City. April 3.

Company.	Par Val.	High.	Low.	Shares
Ajax	$1	15	15	200
Beck-Tunnel	1	9	9	1,000
Butler Liberal	1	14⅝	13⅞	5,645
Carisa	1	14	11½	7,600
Columbus Con	....	1.19	1.18	600
Con. Mercur	....	35½	33	5,100
Daly	20	2.50	2.25	400
Daly Judge	....	6.00	6.00	30
Daly West	20	15.75	13.00	135
Grand Central	....	3.10	3.10	100
Ingot	1	1⅞	1⅝	5,000
Little Chief	1	4½	3½	55,200
Lo. Mammoth	25	10	10	1,000
May Day	25	29	18½	78,200
Mammoth	1	1.10	1.00	300
Naildriver	....	41	41	820
New York Bonanza	1	.54	.50	8,499
Richmond-Ana	....	7	7	5,000
Sacramento	....	7½	7½	500
Silver Shield	....	42½	37	14,550
Star Con	1	12½	11	7,000
So. Swansea	....	4	4	200
Tetro	1	19½	19½	2,000
Uncle Sam Consolidate	1	40½	39½	9,450
United Bingham	....	15	14½	3,000
Victor Con	....	4½	4½	2,000
Victoria	1	1.95	1.90	300
Wabash	....	1.55	1.55	.....
Yankee Con	....	43½	43	3,300

Total sales 216,729 shares.

St. Louis, Mo.* April 1.

Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo	$10	$0.10	$0.25
Center Creek	10	†1.50	1.70
Central Coal & C	100	†67.00	70.25
Central C & C., Pf	100	†78.50	80.50
Central Lead, Mo	100	120.00	125.00
Columbia Lead, Mo	10	.25	1.90
Con. Coal, Ill	100	30.00	32.00
Doe Run Lead, Mo	100	117.50	120.00
Granite Bimet., Mont	10	.35	.37
St. Joe Lead, Mo	10	16.50	17.50

*By our Special Correspondent. †Ex-Dividend.

Montreal.* April 1.

Company.	Par Val.	High.	Low.
Dominion Coal	$100	86.50	80.00
Dominion Coal, Pf.	100	117.00	.....
Dom. I. & St.	100	23.50	22.25
Dom. I. & St., Pf.	100	71.50	69.00
Montreal Steel	100	.....	.....
Nova Scotia St.	100	66.75	64.50
N. S. Steel, Pf.	100	.....	.....

*Montreal Stock Exchange.

San Francisco.* March 23.

Company.	Location.	Opening. H.	Opening. L.	Closing. H.	Closing. L.	Sales.
MacNamara	Nev.	.43	.42	.49	.47	43,100
Mont. Tonopah.	Nev.	3.10	....	3.10	3.02½	4,850
Ton. Belmont	Nev.	.....	.....	1.15	....	1,350
Ton. Midway	Nev.	.....	.....	1.70	1.50	13,400
Ton. Mg. Co	Nev.	11.87½	....	15.00	....	1,080
Ton. North Star	Nev.	.54	.52	.62	.56	26,400

* San Francisco & Tonopah Exchange.
Total sales, 90,180 shares.

San Francisco (By Telegraph.)

Company.	April 3	April 4
Belcher	.21	.20
Best & Belcher	.95	.92
Caledonia	.45	.45
Challenge Con	.15	.16
Chollar	.12	.12
Confidence	.68	.65
Con. California & Virginia	1.50	1.60
Crown Point	.09	.08
Gould & Curry	.16	.18
Hale & Norcross	.75	.79
Mexican	1.50	1.55
Ophir	7.50	8.25
Overman	.10	.14
Sierra Nevada	.39	.40
Union Con	.60	.65
Yellow Jacket	.11	.10

New York.

Company.	Val.	Mar. 29 H.	Mar. 29 L.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H.	Mar. 31 L.	Apr. 1 H.	Apr. 1 L.	Apr. 3 H.	Apr. 3 L.	Apr. 4 H.	Apr. 4 L.	Sales.
Alice	$25	....	....	.85	.80	.80	....	.80	.75	.70	....	.70	.69	1,250
Amalgamated	100	79	78	79½	78½	80½	79½	80¾	80¼	81	80¼	81½	80½	252,805
Anaconda	25	29⅜	29¼	29	28¾	30½	....	29¼	....	30	29½	30	29½	6,945
Best & Belcher	3	....	....	....	....	....	....	....	....	....	....	....	....	.....
Brunswick	1	....	....	....	....	....	....	....	....	....	....	....	....	.....
Caledonia	1	....	....	.47	....	....	....	....	....	....	....	....	....	200
Chollar	2½	....	....	....	....	.15	....	....	....	....	....	....	....	200
Confidence	3	....	....	....	....	....	....	....	....	....	....	....	....	.....
Consolidated Cal. & Va	2½	....	....	....	....	....	....	....	....	1.70	1.65	1.50	1.45	400
Daly	20	....	....	....	....	....	....	....	....	....	....	....	....	.....
Elkton Consolidated	1	....	....	....	....	.65	.63	....	....	.64	.63	.62	....	1,900
Federal Mining and Smelting	100	....	....	....	....	....	....	....	....	....	....	111	110	300
Preferred	100	94½	94½	96	94½	95½	95⅜	95½	....	97½	96	99¾	97½	17,400
Greene Consolidated Copper	10	28½	28¼	....	....	28⅝	28¼	28¼	....	28⅜	28⅛	28⅜	28⅛	6,000
Greene Consolidated Gold	10	7½	7½	7⅛	7	7½	7⅛	7⅛	....	7¼	7⅛	7⅜	7⅛	8,860
Hale & Norcross	3	....	....	75	....	....	....	....	....	....	....	....	....	200
Homestake	100	....	....	76½	....	....	....	....	....	....	....	....	....	100
Horn Silver	20	....	....	....	....	1.75	....	....	....	....	....	....	....	200
Iron Silver	20	3.60	....	....	....	3.50	....	3.50	....	....	....	3.75	....	550
Isabella	1	.30	....	....	....	....	....	.29	....	.28	....	....	....	1,700
Justice	2	....	....	....	....	....	....	....	....	....	....	....	....	.....
Little Chief	20	.07	....	....	....	....	....	....	....	....	....	....	....	300
Mexican	3	....	....	1.60	1.55	1.50	....	1.65	....	1.65	....	....	....	600
Mollie Gibson	5	....	....	....	....	....	....	....	....	....	....	....	....	.....
Occidental	3	....	....	....	....	....	....	....	....	....	....	....	....	.....
Ontario	100	....	....	....	....	....	....	....	....	....	....	2.50	....	20
Ophir	3	7.25	....	7.00	....	....	....	8.00	....	7.62½	....	....	....	800
Phoenix	1	....	....	....	....	....	....	....	....	....	....	....	....	.....
Portland	1	....	....	....	....	....	....	....	....	....	....	2.45	....	100
Potosi	1	....	....	....	....	.11	....	.13	....	....	....	....	....	700
Quicksilver	100	....	....	....	....	....	....	....	....	....	....	....	....	.....
Quicksilver, pf.	100	....	....	2.25	....	....	....	....	....	....	....	....	....	100
Savage	3	.15	....	.15	....	....	....	....	....	....	....	....	....	1,200
Sierra Nevada	3	.37	.36	....	....	....	....	....	....	....	....	....	....	500
Silver Hill	10	....	....	....	....	.64	.63	....	....	....	....	....	....	500
Small Hopes	20	....	....	....	....	....	....	....	....	.30	....	....	....	50
Standard Consolidated	10	....	....	....	....	....	....	....	....	....	....	....	....	.....
Tennessee Copper	25	....	....	26½	....	28	27	28	....	29	28¼	30	29	2,700
Union Consolidated	1	....	....	.63	....	....	....	....	....	....	....	.60	....	900
United Copper	100	7⅛	7⅛	12	9½	13⅜	12	14½	13⅜	15½	14	14½	13½	53,030
Work	1	....	....	....	....	.14	.13½	....	....	....	....	.15	....	1,500
Yellow Jacket	3	....	....	....	....	....	....	.12	....	....	....	.11	.10	800

Total sales, 362,810 shares.

Boston.

Company.	Par Val.	Mar. 29 H.	Mar. 29 L.	Mar. 30 H.	Mar. 30 L.	Mar. 31 H	Mar. 31 L.	Apr. 1 H.	Apr. 1 L.	Apr. 3 H.	Apr. 3 L.	Apr. 4 H.	Apr. 4 L	Sales.
Adventure Con	$25	....	....	5½	....	5½	....	....	....	5½	....	6	5½	535
Allouez	25	21½	21½	21½	....	22	21½	21½	21½	21½	21½	22	21½	910
Amalgamated	100	79	78⅜	79½	78½	80½	79½	80⅜	80⅛	80¼	80⅜	81½	80½	25,877
Am. Z. L. & Sm	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Anaconda	25	....	....	....	....	29¼	29	....	....	....	....	29¼	29¼	355
Arcadian	25	1½	....	1½	....	....	....	1½	....	1½	....	....	....	235
Arnold	25	1	....	....	....	....	....	....	....	....	....	....	....	50
Ash Bed	25	....	....	....	....	....	....	....	....	1⅜	....	....	....	150
Atlantic	25	16½	16	....	....	16½	16½	....	....	16½	....	16½	16½	980
Bingham Con	50	32	31½	31	....	32	....	32	31	32	31½	31½	30⅝	1,972
Bonanza Dev. Con	10	.70	....	....	....	....	....	....	....	....	....	....	....	100
Boston Con	10	6½	....	7	6½	....	....	....	....	7	6½	....	....	1,700
Calumet & Hecla	25	676	675	673	....	....	....	....	....	....	....	....	....	63
Catalpa	10	....	....	....	....	....	....	....	....	15	....	....	....	450
Centennial	25	....	....	17½	17	17½	17	18	17½	18	....	17½	....	1,965
Con. Mercur	5	.33	.32	.33	....	....	....	....	....	....	....	....	....	1,900
Continetal Zinc	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Copper Range Con	100	76½	75½	76	75	76½	75⅝	76½	76⅜	77	75½	76½	75½	10,468
Daly West	20	15	14¼	14⅜	11½	13¼	12½	13½	13	14¼	13½	14	13½	7,709
Elm River	12	....	....	....	....	....	....	2½	....	....	....	....	....	5
Franklin	25	10½	10	10	....	10½	10	10½	10½	10½	....	10½	10	780
Granby	10	6	5⅞	....	....	6	5⅞	6	....	6	....	6½	6	1,638
Greene Con. Copper	10	28½	28½	28½	27⅝	28½	28	28½	....	28⅜	28⅛	28½	28	2,638
Guanajuato Con	5	4½	3¾	4⅝	4½	4⅞	4⅝	5	4⅜	5	4 1/16	5	4 1/16	7,795
Isle Royale Con	25	24¾	24	24½	....	24¾	24½	....	....	25½	25	25½	24½	835
Mass Con	25	11	10½	10½	....	....	....	....	....	11	....	10⅝	....	1,025
Mayflower	25	.75	....	....	....	....	....	....	....	1	....	....	....	370
Michigan	25	13¼	13¼	13½	....	....	....	13½	....	14	13⅜	14	13½	1,195
Mohawk	25	54	53	53	....	....	....	53½	....	54	53	53	....	521
Montana Coal & Coke	25	3¼	....	....	....	....	....	....	....	3¼	....	....	....	608
National	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
New Idria	5	....	....	....	....	....	....	....	....	....	....	....	....	.....
Old Colony	25	....	....	1½	....	....	....	....	....	....	....	....	....	50
Old Dominion	25	26	....	26	....	27	26	27	26⅝	....	....	26½	....	825
Osceola	25	99½	98	99	....	100	99	99½	99	99	....	99	98	1,446
Parrot	10	27½	....	28	....	28	....	28	27½	28¼	....	28	27½	315
Phoenix Con	25	1½	....	1⅞	1½	1½	1½	1⅞	....	....	....	....	....	935
Quincy	25	105	....	105	....	105	....	....	....	105	....	....	....	48
Rhode Island	25	....	....	....	....	2	....	....	....	....	....	1½	....	60
Santa Fe	10	....	....	2½	....	2	....	2½	....	....	....	1⅞	....	310
Shannon	10	7⅛	....	7⅛	7½	8	7⅛	8	....	8⅛	8	8⅛	8	1,785
Tamarack	25	130	....	127	126	128	127½	....	....	130	....	....	....	127
Tecumseh	25	....	....	....	....	....	....	....	....	....	....	2½	....	50
Tennessee	25	....	....	....	....	....	....	....	....	....	....	....	....	.....
Trinity	25	10⅛	9⅞	10⅛	10	10⅛	10⅛	10⅛	10⅛	10⅛	10⅛	10⅛	10⅛	7,187
Union Copper Land	25	....	....	....	....	....	....	....	....	3	....	....	....	100
United Copper Co	100	....	....	....	....	....	....	....	....	....	....	14½	14½	300
United States	25	26⅜	26	27	26½	27	26½	27	26⅜	27	26½	27½	26½	21,341
U. S. Coal & Oil	25	9⅝	9½	9⅝	9½	....	....	9½	9⅜	9½	....	9½	....	845
Utah Con	5	42½	42	42½	42	42⅜	42	42½	....	42½	42½	42⅜	42½	4,578
Victoria	25	4¼	4½	4¼	4⅛	4¼	....	4½	....	4½	....	4⅜	....	1,010
Winona	25	....	....	13	....	13¼	....	....	....	....	....	13¼	12¾	310
Wolverine	25	110	....	111	110	....	....	....	....	110	....	110	109	260
Wyandot	25	....	....	....	....	....	....	....	....	2	....	....	....	155

Total sales 114,866 shares.

STOCK QUOTATIONS.

London (By Cable*).

Company.	Apr. 4 £	s.	d.	Company.	Apr. 4 £	s.	d.
Camp Bird	1	13	6	Esperanza	1	0	0
Con. Gold Fields	8	5	0	Modderfontein	10	18	1½
De Beers	17	7	6	Rand Mines	11	3	9
Dolores	1	9	0	Rio Tinto	65	3	9
East Rand	8	15	7½	Simmer & Jack	2	2	6
El Oro	1	4	4½	Tomboy	1	3	9

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York.

Coal, Iron and Industrial Shares.

Company.	Par Val.	Mar. 29 H.	L.	Mar. 30 H.	L.	Mar. 31 H.	L.	Apr. 1 H.	L.	Apr. 3 H.	L.	Apr. 4 H.	L.	Sales.
Allis-Chalmers	$100	....	....	17⅜	16½	17½	17	17⅜	....	17⅜	17	17½	....	4,200
Preferred	100	....	....	62¼	61	62	....	....	....	62	....	....	....	400
Am. Agri. Chem.	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	91½	....	....	....	....	....	....	....	50
Am. Sm. & Ref.	100	101⅞	101⅜	101½	100⅜	103	101½	104⅛	103	105½	104⅛	104⅛	103	102,100
Preferred	100	121½	120¾	121⅝	....	122⅜	121¼	122¼	122½	124	122¼	123¼	123	7,810
Cambria Iron	50	48	....	....	....	48½	....	....	....	48½	....	....	....	56
Cambria Steel	50	27½	27⅛	27½	27	27	26⅞	27	26⅞	27⅝	26⅞	27¼	27	8,506
Col. Fuel & Iron	100	56⅝	55⅝	57⅝	56	58	57⅜	57⅛	57	56½	54½	57	56¼	93,700
Preferred	100	105	....	105	....	....	....	....	....	....	....	103½	....	900
Col. & H. C. & I.	100	16	15½	....	....	16⅛	16⅛	16⅛	16⅜	16⅛	....	17	16⅛	2,150
General Chem.	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	102	....	....	....	....	....	....	....	100
Lehigh Nav.	50	105	....	105	104	106	....	107½	....	108	107½	108⅛	108¼	685
Mong. R. Coal	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	27½	27¼	....	....	125
National Lead	100	43⅛	42⅛	45⅛	44	47⅛	44½	48¾	47⅛	48⅝	46⅝	48¼	46¼	124,100
Preferred	100	108¼	....	109	....	109	108½	110	108¼	110	109½	109½	108	4,600
Phila. Nat. Gas	50	47½	47½	48	47½	†47½	46½	47¼	....	47⅛	....	47⅛	47	10,940
Preferred	50	49	....	....	....	49	....	....	....	....	....	....	....	355
Pittsburg Coal	100	18	17	17	16½	16½	16	16	15⅞	....	....	....	....	2,275
Preferred	100	69½	64	69	66⅜	68⅜	68½	68¼	68	69½	68	72⅛	70½	9,405
Republic I. & S.	100	21⅞	21⅛	22⅞	21⅛	23¼	22⅜	23⅞	23¼	24⅞	23¾	24⅞	23⅜	105,900
Preferred	100	81	79½	82½	80½	82¾	82½	83⅜	82½	84⅛	82¾	84½	83⅛	38,260
Sloss: Shef. S. & I.	100	90	....	94	87	95½	92½	94½	94	100	95	99⅜	97	19,250
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard Oil	100	620	618	622	612	619	614½	....	....	625	622	627	624½	411
Tenn. C. I. & R. R.	100	96¾	94½	98⅝	94½	99½	97⅞	98⅛	97⅜	105	98⅛	106¼	103⅜	286,880
U. S. Steel	100	36	35	35⅞	35⅛	36	35⅜	36	35⅞	36⅛	36	37¼	36⅛	227,250
Preferred	100	95⅜	95	95⅝	95⅛	96⅜	95⅞	96⅜	95⅜	97	96⅜	98⅞	96¼	223,910
Va. Car Chem.	100	34½	34	34½	33⅛	34¾	....	34⅝	34½	37	35⅝	36½	36	6,880
Preferred	100	108	....	108	....	107	106½	107½	....	....	....	108	....	2,145

†Ex-Dividend. Total, 1,283,343.

Mexico.

March 24.

Company.	Shares Issued.	Prices, Mex. Bid.	Ask.	Company.	Shares Issued.	Prices, Mex. Bid.	Ask.
DURANGO:				San Rafael y An., aviada	1,200	$710	$730
Penoles	2,500	$2,600	$3,000	Soledad, aviada	670	1,240	1,250
San Andres de la Sierra	200	10,000	.....	Sorpresa, aviada	960	305	315
GUANAJUATO:				MEXICO:			
Cinco Senores y An., aviadoras	2,000	15	20	Aldebarren	2,000	19	20
Cinco, Senores y An., aviada	400	32	40	Buen Despacho	3,000	40	48
Providencia, San Juan de la Luz	6,000	154	159	Dos Estrellas	3,000	3,650	3,750
GUERRERO:				La Esperanza (El Oro)	3,000	1,500	1,500
Garduno y Anexas	7,200	31	35	Santa Ana, Esperanza	2,400	30	60
HIDALGO:				NUEVO LEON:			
Amistad y Con	9,600	75	76	La Fraternal	1,000	580	620
Carmen, aviada	1,100	160	175	Norias de Bajan	1,000	700	750
Guadalupe Fresnillo Mill	1,000	170	200	SAN LUIS POTOSI:			
Guadalupe Fresnillo Mine	1,400	70	80	Concepcion y An	3,000	20	30
Maravillas y An., aviador	1,680	70	100	El Barreno, aviadora	2,000	98	105
Maravillas el Lobo	1,000	130	180	Sta. Maria de la Paz	9,600	299	302
Refugia, aviada	12,800	5	7	ZACATECAS:			
Sta. Gertrudis y An., aviadas	9,600	7	10	Asturiana y An	2,500	8	12
Sta. Gertrudis y An., aviadora	28,800	75	76	Candelaria y Pinos	2,500	45	60
San Rafael y An., Trompillo	1,200	2,155	2,180	San Carlos y Annexas	2,500	15	20
				Sta. Maria de Gaud	2,500	81	84
				MISCELLANEOUS:			
				Bartolome de Medina	2,000	82	85
				Naica (Chihuahua)	100	11,000	13,000
				Natividad (Oaxaca) aviadora	1,800	600	720
				San Francisco Hac	6,000	90	92
				Union Hacienda	3,000	335	350

Paris.

March 16.

Company.	Location.	Par value.	Latest dividend.	Prices. Opening.	Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1,900.00	1,985.00
Anzin, Coal	France	.....	290.00	5,810.00	5,750.00
Biache-St. Vaast	France	1,000	160.00	3,605.00	3,605.00
Boleo, c	Lower California	500	104.17	2,650.00	2,728.00
Bruay, Coal	France	400	27.50	745.00	745.00
Courrieres, Coal	France	500	110.00	2,961.00	2,940.00
Escombrera-Bleyberg, z.l.	France	350	35.00	720.00	722.00
Huanchaca, s	Bolivia	125	2.50	91.50	89.75
Laurium, z. l	Greece	500	25.00	333.00	325.50
Malfidano, z	Italy	500	50.00	640.00	650.00
Metaux, Cie. Fran. de	France	500	22.50	555.00	555.00
Mokta-el-Hadid. i. l	Algeria	500	40.00	1,030.00	1,035.00
Nickel, n	N. Caledonia	250	22.50	665.00	677.00
Penarroya, Coal	Spain	500	45.00	1,200.00	1,190.00
Vielle Montagne, z	Belgium	30	30.00	858.00	852.00

London.

March 24.

Company.	Par Val.	Latest dividend. Amt.	Date.	Quotations. Buyers.	Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
Alaska Treadwell	5 0	6 0	Feb., 1905	6 2 6	6 5 0
Anaconda	5 0	2 0	Nov., 1904	7 0 0	6 2 6
Camp Bird	1 0	9	Feb. 1905	1 11 3	1 13 9
Copiapo	2 0	5 0	Oct., 1904	1 8 9	1 11 3
De Lamar	1 0	2 0	Nov., 1904	16 3	18 9
El Oro	1 0	9	July, 1904	1 3 9	1 6 3
Frontino & Bolivia	1 0	rts.	Mar., 1904	17 0	18 0
Le Roi	5 0	5 0	Nov., 1899	13 9	16 3
Le Roi No. 2	5 0	2 0	Jan., 1905	16 3	18 9
Mesquital	1 0	3	Feb., 1903	2 9	3 3
Montana	1 0	6	Apr., 1899	1 0	1 6
Palmarejo & Mex	1 0	3	Nov., 1904	13 0	14 0
*Stratton's Indep'd	1 0	6	Feb., 1905	8 3	8 9
St. John del Rey	1 0	6	Dec., 1904	12 6	13 6
Tomboy	1 0	1 0	Dec., 1904	1 5 0	1 10 0
Tyee	1 0	2 0	Dec., 1904	1 11 3	1 13 9
Utah Con	1 0	6 0	Jan., 1905	8 0 0	8 10 0
Ymir	1 0	1 0	Mar., 1902	1 3	3 9
European:					
Libiola	5 0	1 6	May, 1904	1 15 0	1 17 6
Linares	3 0	5 0	Mar., 1905	4 5 0	4 15 0
Mason & Barry	1 0	7 0	May, 1904	2 17 6	3 2 6
Rio Tinto	5 0	37 6	Apr., 1905	64 17 6	65 2 6
Rio Tinto, pf	5 0	2 6	Apr. 1905	6 2 6	6 7 6
Tharsis	2 0	7 0	May, 1904	5 17 6	6 2 6
West Australian:					
Associated	1 0	2 6	July, 1904	1 12 6	1 13 9
Cosmopolitan	1 0	1 0	Apr., 1904	6 0	6 6
Golden Horseshoe	5 0	6 0	Nov., 1904	7 11 3	7 13 9
Great Boulder	2	9	Mar., 1905	1 1 6	1 2 0
Gt. Boulder Perse	1 0	9	Mar., 1905	10 9	11 3
Great Fingall	1 0	7 6	Apr., 1905	8 1 3	8 3 9
Ivanhoe	5 0	5 0	Jan., 1905	7 16 3	7 18 9
Kalgurli	1 0	2 6	Apr., 1905	7 7 6	7 10 0
Lake View	1 0	1 6	Oct. 1904	16 3	17 6
Oroya-Brownhill	1 0	4 0	Mar., 1905	3 11 1	3 12 3
Miscellaneous:					
*Brilliant Central	1 0	6	Mar., 1905	12 6	17 6
Brilliant & St. Geo.	10	6	Mar., 1905	15 6	16 6
Briseis Tin	1 0	.....	.....	11 6	12 6
Broken Hill	8	1 6	Feb., 1905	2 1 6	2 2 6
Mt. Lyell	3 0	1 3	Dec., 1904	16 0	17 0
*Mt. Morgan	1 0	3	Mar., 1905	2 11 3	2 13 0
*Waihi	1 0	2 6	Mar., 1905	6 10 0	6 12 6
Indian:					
Champion Reef	10	1 5	Jan., 1905	1 13 9	1 15 0
*Mysore	10	5 6	Mar., 1905	6 15 0	6 17 6
Nundydroog	10	1 6	Mar., 1905	1 10 0	1 11 3
Ooregum	10	9	Apr., 1905	18 9	1 0 0
Ooregum, pf	10	9	Apr., 1905	1 6 3	1 8 9
South African:					
Angelo	1 0	5 0	Feb., 1905	6 11 3	6 13 9
Bonanza	1 0	7 0	Feb., 1905	17 6	1 0 0
British So. Africa	1 0	rts.	May, 1899	1 16 3	1 17 6
Cape Copper	2 0	6	Jan., 1905	4 2 6	4 5 0
Cape Copper, pf	2 0	6	Jan., 1905	3 15 0	4 0 0
*City & Suburban	4 0	6 0	Feb., 1905	5 5 0	5 10 0
Consol. Gold-F'lds.	1 0	2 6	Dec., 1904	7 17 6	8 0 0
Crown Reef	1 0	1 0	Apr., 1905	14 10 0	15 0 0
*De Beers, preferred	2 10	10 0	Feb., 1905	18 1 3	18 3 9
*De Beers, deferred	2 10	2 0	Feb., 1905	17 11 3	17 13 9
East Rand	1 0	4 0	Feb. 1905	8 7 6	8 10 0
Ferreira	1 0	27 6	Feb., 1905	20 0 0	21 0 0
Geldenhuis	1 0	5 0	Feb., 1905	4 18 9	5 1 3
Geduld	1 0	rts.	Mar., 1902	7 8 9	7 10 0
Henry Nourse	1 0	8 0	Feb., 1905	7 15 0	8 0 0
Heriot	1 0	5 0	Sept., 1899	3 12 6	3 17 6
*Jubilee	1 0	5 0	May 1905	3 5 6	3 10 0
Jumpers	1 0	2 6	May, 1904	2 0 0	2 5 0
Knights	1 0	.....	.....	5 17 6	6 0 0
Langlaagte	1 0	2 0	Feb., 1905	3 10 0	3 12 6
May	1 0	4 0	Feb., 1905	3 17 6	4 0 0
Meyer & Charlton	1 0	5 0	Feb., 1905	4 17 6	5 2 6
Modderfontein	1 0	rts.	Apr., 1902	10 11 3	10 13 9
Namaqua	2 0	3 0	Dec., 1904	3 13 9	3 16 3
New Goch	1 0	.....	.....	2 16 3	2 18 9
New Kleinfontein	1 0	rts.	Apr., 1902	2 5 0	2 7 6
New Primrose	1 0	3 0	Feb., 1905	3 1 3	3 3 9
Rand	5	5 0	Aug., 1904	10 17 6	11 0 0
Randfontein	1 0	rts.	Apr., 1899	2 16 11	2 17 7
Robinson	5 0	8 0	Feb., 1905	9 7 6	9 12 6
Robinson Deep	1 0	3 0	Aug., 1904	6 3 9	6 6 3
Rose Deep	1 0	3 0	Feb., 1905	8 0 0	8 5 0
Salisbury	1 0	2 0	May., 1905	1 10 0	1 15 0
Sheba (fully paid)	1 0	rts.	Feb., 1904	9 0	10 0
Simmer & Jack	1 0	6	Aug., 1904	2 1 3	2 3 9
Village Main Reef	1 0	4 0	Jan., 1905	6 2 6	6 7 6
Wemmer	1 0	12 6	Dec., 1904	7 12 6	7 17 6

*Ex-dividend.

Ishpeming, Mich.*

Week, April 1.

COMPANY.	Par Val.	High.	Low.	Last Sale.
Black Mountain ($2 paid)	$5	$2.00	$2.00	$2.00
Black Mountain (Full paid)	5	.....	.....	4.75
Calumet & Arizona	10	106.50	105.00	105.00
Calumet & Pittsburg	10	41.00	37.00	41.00
Junction Dev. ($11 paid)	15	98.00	87.00	100.00
Lake Superior & Arizona	10	8.25	8.00	8.00
Lake Superior & Pittsburg	10	46.50	43.00	46.00
Pittsburg & Duluth ($8 paid)	15	25.50	23.00	25.50
Pittsburg & Duluth (Full paid)	15	27.50	25.00	26.00
Wolv. & Ariz. ($10.50 paid)	15	4.50	4.00	4.50

* By The Wallace H. Hopkins Co.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Commercial Sizes of Coal.—Can you tell me what is the difference between what the market reports refer to as the prepared, or domestic, and the steam sizes of anthracite coal? What is the cause of the difference? I should like to know also what, if any, are the ordinary sizes in which bituminous coal is sold.—C. T.

Answer.—The prepared or domestic sizes of anthracite are those ordinarily sold for domestic use, as best fitted to burn in stoves, furnaces and the like. The sizes under this head are lump, which is the large coal as it comes from the mine, and is now little used, except for blast furnaces and the like; broken, egg, stove and chestnut. Formerly there was an additional size, known as steamboat, which was larger than egg, but this has gone out of use. The smallest prepared size, chestnut, will pass over a screen with 1-in. openings; it was, for many years, the smallest size saved, all smaller material going into the culm pile. As anthracite became more expensive, more thorough screening was adopted and smaller sizes saved. These are known as the steam sizes, because they can be burned best in larger fire-boxes, as those of steam boilers, where proper grates and feeding appliances are used. At first only one size of small coal was saved, but the practice extended until now there are four known to the trade: Pea, which will pass over a screen with ⅝-in. opening; buckwheat, over ½-in. screens; No. 2 buckwheat, or rice, over ⅜-in. screens; No. 3 buckwheat, or barley, over ¼-in. screens. A screen with 3-16-in. openings has also been used for rice. Only what passes through the smallest screen is now considered culm, or slack. Pea coal is used for domestic purposes to some extent, generally mixed with chestnut. The small sizes are sold in competition with bituminous coal, generally; they have, therefore, to be sold at lower prices than the domestic coal.

The bituminous coal which comes to the seaboard is usually sold as it comes from the mine, without sizing. In the Pittsburg district there are four recognized commercial grades: Run-of-mine, which is coal as it comes from the mine, without sizing; lump, which includes all coal passing over a screen with 1¼-in. openings; nut, which is coal which passes through the 1¼-in. screen, but over a ¾-in. screen; slack, which includes all that passes through the ¾-in. screen. This classification has been generally adopted through the Western coal trade.

Of course, anthracite will stand breaking and close classification much better than bituminous coal, owing to its hardness. This makes the sizing and separation a different matter from the preparation of bituminous coal, which is limited to simple screening, or to washing and screening.

Recent Legal Decisions.

SPECIALLY REPORTED.

DUTY ON SPECIAL STEEL WIRE.—Round steel wire, used for dental instruments, valued above 4c. per lb. was held to be dutiable under paragraph 137, tariff act of 1897, at 40% *ad valorem*.—Appeal of Boker & Co., from Collector of Customs at New York; Board of General Appraisers.

STONE CONSIDERED AS MANUSCRIPT.—A limestone slab, 4 by 5 ft. in dimensions, cut and carved about 800 B. C., bearing upon one of its surfaces a rude relief of the human figure and an inscription in the Assyrian language, the inscription taking up about 50% of the said surface, and the whole being of value only for the writing placed thereon, found to be a manuscript and free of duty as such under paragraph 609, tariff act of 1897.—Appeal of D. Z. Noorian from Collector of Customs at New York; Board of General Appraisers.

DUTY ON MIXED EARTHS AND CLAY.—In determining the proper classification of imported merchandise importers are not bound by their entry or invoiced description of the goods. It appears from the collector's report that said merchandise is clay mixed with other substances; hence it is not clay such as is provided for in paragraph 93, nor can it be classified as gravel or sand by reason of the admixture of other substances. We incline to the opinion that the substance is a combination of free and dutiable materials not enumerated in the tariff and, not being manufactured, is dutiable at 10% *ad valorem*, under section 6 of the act of 1897.—Appeal of O. Patterson from Collector of Customs at Cape Vincent, N. Y.; Board of General Appraisers.

The recently announced solubility of gold in hydrochloric acid containing formaldehyde is not supported by careful experiment.

New dynamo brushes are made by covering graphite particles with copper and tin, which metals are converted to a bronze coating by heat and pressure. These brushes can be polished and soldered. They show smaller loss from the current-heat, and have other desirable qualities. They themselves wear out sooner than carbon brushes, but they show less wear of the collectors.

Abstracts of Official Reports.

Delaware & Hudson Company.

This company owns a large estate in the Wyoming division of the anthracite coal region in Pennsylvania. In addition it owns, or leases, and operates an extensive system of railroads, running from its Pennsylvania properties to Albany, and thence north to Rutland in Vermont and to the Canada line, with numerous branches. Its original transportation line was the Delaware & Hudson canal, now abandoned, which extended from Honesdale to the Hudson river at Rondout. The present report covers the year 1904, and is the 75th annual report issued by the company.

The total earnings of the company, including all operations, were $34,655,113. Expenses and taxes were $27,202,634, leaving net earnings of $7,452,479. The interest and rentals paid amounted to $2,999,957, leaving a surplus of $4,452,522, which was equal to 11.06% on the stock. Dividends amounting to $2,756,163, or 7%, were paid; the sum of $1,500,000 was charged to profit and loss and credited to account of mining plant; the balance, $196,359, was added to surplus.

During the year bonds to the amount of $585,000 were paid, and the sum of $417,100 in stock was canceled through the sinking fund, to which is credited 5c. for each ton of coal mined.

The company's estimate of its coal resources is as follows: Coal owned and controlled, Jan. 1, 1904, was 223,293,754 tons; acquired during the year, 683,200 tons; total, 223,976,934 tons. The coal mined during the year was 5,332,668 tons, leaving the estimated total 218,644,286 tons on Jan. 1, 1905.

The total quantity of coal produced by the company during the year was 5,332,668 tons. The stock on hand at the close of the year was 203,176 tons. The earnings and expenses of the Coal Department for the year were as follows, the averages being computed on the total coal produced, as above:

	Amount.	Per ton.
Coal sales at mines	$163,503	....
Coal sales to Railroad Department	1,243,503	....
Coal sales at other points	17,493,730	....
Coal added to stock	131,678	....
Total sales and earnings	$19,032,414	$3.57
Mining and preparing coal	$10,562,283	$1.98
Coal bought	256,146	0.05
General expenses	77,393	0.02
Transportation, D. & H. lines	4,835,139	0.91
Transportation, other lines	1,123,174	0.21
Handling expenses	121,287	0.02
Sinking fund, on coal mined	228,006	0.04
Total expenses	$17,203,428	$3.23
Net earnings	$1,828,986	$0.34

It will be seen from this table that the average cost per ton of mining coal, including the sinking fund and general expenses, was $2.09; while the transportation and handling amounted to $1.14, or 35.3% of the total expenses. The expenses were 90.4% of the gross receipts.

The betterments made during the year, and included in cost of mining, amounted to $444,634. The more important items were $183,036 for new shafts and openings, including machinery, and $153,407 for new breakers. There was charged off for depreciation of mining equipment $43,535, and for decrease in unmined coal $67,400. These charges were in addition to the sinking fund on coal mined.

The company's railroads carried during the year 8,255,541 tons of anthracite coal, a decrease of 402,425 tons, or 4.6%. Other mineral freights carried included 1,259,806 tons of bituminous coal; 42,111 tons of coke; 455,518 tons of iron and other ore; 470,800 tons of stone, sand, etc. There was also carried 424,421 tons of iron and steel in all forms, and 363,614 tons of brick, lime and cement. The anthracite coal carried was 52.9% of the total freight tonnage.

Delaware, Lackawanna & Western Railroad Company.

This company owns railroad lines extending from Hoboken to Buffalo and Oswego, with numerous branches. It also owns a large coal estate in the Wyoming division of the anthracite coal region. Unlike most of the anthracite-carrying companies, it operates its coal properties directly, and not through the medium of a subordinate company. The report is for the year ending Dec. 31, 1904.

The earnings of the railroad were $28,701,991 gross, and $12,049,217 net. After paying all interest on bonds, rentals, etc., there was a surplus of $6,773,780, from which dividends amounting to $4,454,780, or 17% on the stock, were paid. Of the gross earnings, $13,230,870 were from the transportation of coal. The coal carried was 8,615,798 tons; the ton-mileage of coal, 1,531,125,705, the average haul being 178 miles. The average earnings per ton of coal were $1.54; per ton mile, 0.864 cent. The average train-load reported was 445.35 tons.

The report of the Coal Department gives the following figures for two years, in long tons:

	1903.	1904.
Coal on hand, Jan. 1.	161,584	655,920
Coal mined and bought	9,130,680	9,176,686
Total	9,292,264	9,832,606
Coal sold:		
At mines	104,571	87,914
Company's supply	1,207,358	1,309,841
Local agencies.	5,514,888	5,459,641
Foreign agencies.	1,809,527	2,019,810
Total sales.	8,636,344	8,877,206
Stock, Dec. 31.	655,920	955,400

Foreign agencies are those not on the company's own lines. The increase in coal mined and bought was 46,006 tons, or 0.5%. The increase in coal sold was 240,866 tons, or 2.8%. The coal reported for company's supply is used by the railroad, and does not include that consumed at the mines. The coal added to stock was 299,480 tons.

The income account of the Coal Department is as follows:

	Amount.	Per ton.
Coal sales at mines	$187,098	$2.13
Company's supply	1,483,486	1.13
Local agencies	21,552,270	3.95
Foreign agencies	12,526,969	6.20
Total coal sales.	$35,749,823	$4.03
Earnings of company's barges	200,752	0.26
Coal added to stock	484,203	1.62
Total earnings.	$36,434,778	$3.97
Cost of coal mined and bought	$15,779,502	$1.72
Transportation on company's lines	13,029,220	1.73
Transportation on other lines	1,569,555	0.70
Handling and selling	1,549,555	0.27
Vessel expenses.	297,395	0.38
Improvements at mines, etc.	764,075	0.08
Total expenses	$32,989,302	$3.59
Net earnings	$3,445,476	$0.38

The averages per ton are calculated in each line on the tonnage to which the earnings and expenses respectively apply. The averages on the total lines are calculated on the totals mined and bought, as given in the first table. The item of handling and selling includes $761,180 cost of agencies; $612,788 commissions, and $175,587 general expenses. Of the expenses, mining the coal formed 47.8%; transportation, 45.2%; handling and selling, 4.7%; improvements at mines, 2.3%. The expenses were 90.5% of the gross earnings.

The report says: "The operations of the Coal Department were, as the results show, highly satisfactory. The demand for anthracite coal was uniformly good throughout the year for all of the large or domestic sizes; for the sizes below chestnut, or the steam coals, so called, the demand was not so great, and this company with most of the other large producers, accumulated in stocks a larger quantity thereof than usual. However, the severe weather conditions that have prevailed this winter have created an abnormal demand for steam coals, and present indications are that by April 1 the accumulated stocks above referred to will be reduced to normal quantities.

"The company produced from its own mines during the year, 6,531,215 tons, or 342,785 tons more than in any previous year in its history. It produced from its washeries 781,132 tons, or 224,100 tons less than in 1903. It purchased from other mining companies 1,773,669 tons, or 60,665 tons less than in 1903. The decrease was due chiefly to one of the companies from which it purchases coal losing one of its breakers by fire in June last, and its new breaker not being rebuilt and in operation until the close of the year. The amount of coal transported by the company for individual operators at the regular freight rate was 412,148 tons, or 140,342 tons less than in 1903. This was chiefly due to these operators producing less coal and finding markets for more of what they did produce on the lines of other roads than on the lines of this company.

"The foregoing will in part explain why the earnings of the company from transportation of coal during the past year were less than in 1903. This is further explained by the fact that at the close of the year there were stored at Scranton, in the stock-piles of the company, 188,710 tons more of the steam sizes of coal than at the close of 1903. This coal being stored at the mines, no transportation charges were earned on same.

"The relations that have existed during the year between the company and its mine employees have been friendly and cordial; not a single difference of consequence has arisen which the officials of the company have not been able to adjust without difficulty with its men, and no appeal or recourse has been had by the employees or the company to the Conciliation Board constituted by the award of the Strike Commission of 1902. The mines of the company have been operated almost constantly and to their full capacity; the mine employees have earned good wages and are prosperous, and the conditions generally of the merchants, manufacturers and business interests in the anthracite regions show unmistakably that this great industry is in a sound, healthy, prosperous condition, and the outlook for the future most promising.

"Much work has been undertaken and in part completed during the year in the way of improving the coal properties of the company. The cost of same, aggregating $764.075, has been charged in the expenses of the Coal Department for the year. The work is all in line with the previously defined policy of the company for developing and improving its valuable and important coal properties, so that it will at all times be in a position to economically mine and prepare its full share of the anthracite coal which the constantly growing market for this desirable fuel will readily take."

A Compact Electric Mine Locomotive.

A very compact form of electric locomotive, for use in underground and surface haulage at mines, is described in the recently issued catalogue of the Morgan-Gardner Electric Co., of Chicago. These locomotives are built of sizes from 50 to 250 h. p., and weights from 5 to 25 tons. They are double-armature type with four driving wheels and flexible base. This flexibility makes it possible for the wheels to follow the rails on very narrow or uneven tracks. The main frame is cast all in one piece and closed across the bottom, which prevents the dirt and mud from getting up into the working parts. The frame also comes all inside between the drive wheels, which allows it to run in entries with small space outside of the rails, where an outside framed locomotive could not be used. The motorman rides on either end, and all the necessary levers for controlling can be operated from either end. The frame at each end is higher than at the sides, so as to protect the motorman in case of an accident. The motors are of the multipolar type with internal fields, and completely closed in, except small openings at commutator,

which is protected by a cover, thus avoiding any danger of slate or any substance from falling into the armatures. The armatures are of the toothed gram-ring type, with the coils wound below the surface, which protects them from danger. All gears are made from cast or hammered steel, and can be removed without taking the locomotive apart. The locomotive is provided with controlling lever, reverse lever, sand-box lever at both ends, brake levers and electric headlight at both ends. The brakes will hold the wheels dead on sanded track. These locomotives can be built to run on ordinary gauges of track. The drive wheels have iron centers with rolled steel tires. The mode of operation is trolley and rail return. The controller is of best magnetic blowout construction, thoroughly insulated throughout, entirely waterproof, and guaranteed under full current to show rise not over 50° above normal temperature. A large number of these locomotives are in use.

We may add that the catalogue referred to also describes the coal-cutters and other electrically operated machines made by the company.

The Smith Box-Car Loader.

The Smith loader is a new type of machine, which has been designed and is made by the Duncan Foundry & Machine Works, at Alton, Ill. The special objects sought for in its design have been to load the coal without the intervention of labor, to avoid handling and rehandling, and to load it in such a way as to avoid force, which necessarily produces breakage of the coal and an undue quantity of slack. In this loader coal is passed from the main chute directly into the car, and placed in that part of the car where it is desired to have it.

The Smith loader receives the box car upon its cradle, and as soon as the car is secure, loading may be begun at once. It is usual to start loading in the center of the car, and by simple, easy handling the car is tilted to a proper angle to permit the coal, by gravity, to reach the end of the car; when this is accomplished the car is tilted to its other end, and that end filled as well.

It is frequently the trade demand that cars be loaded on each end only, leaving a vacant space in the center for easy entrance. The Smith loader accomplishes this result easily; before the chute is lowered the car is merely tilted to an angle sufficient to run the coal where desired.

The pit is preferably lined with concrete, although masonry of stone or brick may be used. Concrete has advantages in that it is more cheaply installed and its efficiency in preventing seepage, etc., is beyond question. The installation of the pit requires, on estimate, say, 171 yd. broken stone, 103 yd. sand, 160 bbl. cement.

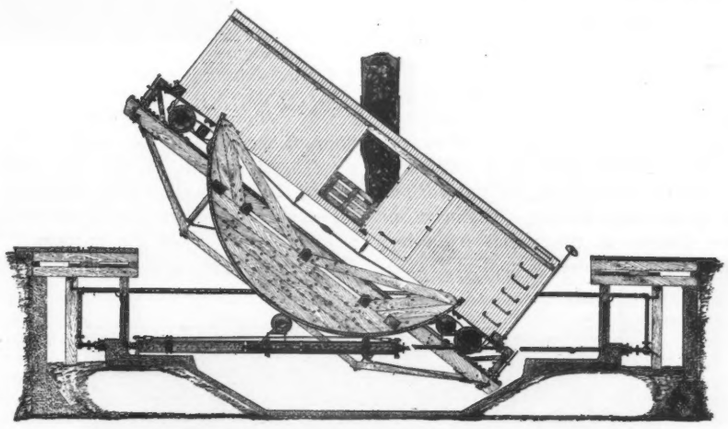
After completion of the pit, the bearings are placed therein. They consist of four heavy castings, two at each side of the loader. In these bearings are placed the four main bearing shafts, upon which are mounted four heavy cast-steel rollers, designed in such shape that the center forms a raised ridge ¾ in. high by 2 in. wide around the entire roller, forming a positive guide to receive the cradle.

The cradle is made up of a heavy network of timbering, secured together with bolts of large dimensions, and keyed together in such a manner that joints cannot rack or loosen from the weight and strain. The two outside faces of the cradle are built up in a circular form, and upon these two faces 12 in. by ½ in. steel bands are securely bolted around its entire surface. Upon these plates are placed four rails, in pairs, rolled accurately to a known circle; the rails are rolled perpendicular with the base and ball; and when they are mounted in pairs with the bases together there is, by the difference between the width of the base and ball, a space left which forms a way or groove around the entire surface of the cradle. The size of this groove is such that it conforms to the raised portion on the steel rollers previously mentioned, and the cradle in its moving or tilting operation has a positive guide. Because of this, there is no possibility of lateral motion, the entire weight of the loader, car and coal being taken on the faces of the four rails, which in like manner transfer the weight to the steel rollers and bearings below. The entire structure of bearings, etc., is low and compact, obviating any inclination to lateral tipping. At the top, and in the center of the cradle, is placed the track to receive the cars; and at each end, in the center of the track, are located two stops of heavy pattern, which take the weight of the car when it and the cradle are in the tilted position. The stops are handled by hydraulic cylinders, and upon the face of the cradle, between the tracks, are placed two heavy iron racks, with spaced notches to accommodate a moving backward or forward of the stops, thus permitting the use of different lengths in box cars. When the car is in loading position the stops take the thrust of the weight from the bumper of car, thus avoiding possible strain upon a weak portion of it.

The tilting or rolling of the cradle is accomplished by means of two cylinders 15 in. in diameter, 24 ft. long, moved by hydraulic pressure furnished by a pump working under pressure of 250 lb. The 15-in. cylinders move, and the piston rod is stationary. To each cylinder is attached a wire rope, which, in turn, is attached to the cradle of the loader, through which the movement is accomplished. A novel method of supplying the cylinders with water is through the piston; it is constructed of 4½-in. extra heavy pipe, and by the agency of a part next the piston head it furnishes not alone the supply, but also a source of escape when the cylinder is reversed for motion.

The pump used for operating the loader is of heavy duplex pattern, and of such capacity that a few strokes of the piston serve to turn the cradle of the loader from one extreme point to the other. It is evident that the pump controls the capacity of the loader, and that by the mere turning on or off of the steam supply the capacity of the loader is positively governed. The only parts of the pump exposed to wear are its working parts, and so much greater is the capacity of the pump than its required actual duty that the cost of maintenance is small. The ease with which the hydraulic power acts to perform the motion of the loader relieves all straining and racking of parts. The pump receives its supply of water from a small tank placed at any convenient point; the exhaust of the loader cylinders is led back to this supply or tank; thus the loss of water is reduced to a minimum when the loader is in use. It is not necessary to stop the pump when reversing the motion of the cradle. For this purpose a four-way cock of heavy pattern is supplied, which governs absolutely the motion of the water.

The labor cost in the operation of the Smith loader is one of its economical features. But one man (or boy) is required



SMITH CAR-LOADER.

by the loader, and one man to handle the cars.

The cradle of the loader is built with a 2% grade, so that at the moment the brake is released the loaded car is in motion, to be followed by an empty; and so quickly is this change effected that box cars can be loaded practically as fast as flats. The speed is lessened only by a lack of celerity in handling the cars.

After installation, the cost of maintenance is small. For a number of years there should be practically no expenditure for repairs. The only parts that can possibly show wear are the valves in pump, and as these are of large capacity they should last indefinitely.

The manufacturers have recently installed two Smith loaders for the Carney Coal Company, of Sheridan, Wyo., and one for the Consolidated Coal Company, of St. Louis.

A New Radial Coal Cutter.

The accompanying illustrations show a net type of radial coal cutter recently placed on the market by the Ingersoll-Sergeant Drill Company, of New York. While the machine in its present form is new, it is the result of a series of experiments made for the purpose of developing a machine especially fitted for the work of shearing and entry driving. The most important feature is the radial mounting, which is something new as applied in coal-mining machines, although it has long been in use in other types of machinery.

UNDERCUTTING.

It is well known that the requirements of a shearing machine are very severe. The work is hard, but the machine to meet the conditions properly must be light, simple, durable and economical of power. It must also be capable of operating with economy of coal—that is, it must break the coal without producing an unduly large proportion of slack. In experimental operation this new type of cutter has shown itself able to meet these requirements. As an undercutting machine it is adapted for undercutting headings to any desired depth at a single setting. It will also shear either one or both sides of an entry, from the floor of the mine to the roof, to any desired depth at one setting. The drill, or cutter, being mechanically directed, all these operations are performed without any shock or jar on the operator. The machine is light, and easily and quickly moved and mounted, in this respect also appealing to the man who handles it.

The cut made by the radial coal cutter is 8 ft. in depth and diminishes from a width of 4½ in. at the face to about 2 in. at the bottom. The piston and chuck having a rotating movement, the machine can be used as a drill for putting in the holes preparatory to blasting coal. This same fact is of value in permitting the use of the machine as a rock drill for 'brushing' purposes; and the change from a rock drill to a coal cutter can be quickly made. It can, therefore, be used advantageously in sinking shafts, driving tunnels in rock, drilling through spars, clay veins, horsebacks, and similar obstructions.

VERTICAL SHEARING.

The radial coal cutter practically solves the problem which has perplexed coal-mine operators. By its use entries can be driven in less than half the time required by hand methods or any of the so-called entry-driving machines. Its application in the mine increases the percentage of lump coal, besides adding to the output per miner. In mines where the coal is blasted from the solid, this machine may be applied for shearing the rooms in the center, ready for blasting toward the center upon open ends. Being mounted upon a plain vertical column, the radial cutter can be raised or lowered to undercut at any point between roof and floor, and readily applied to slate bands, layers of black-jack and other impurities, leaving the coal mined clean.

Water-gas carries on the average four or five times as much carbon monoxide per unit of bulk as retort gas. Carbon monoxide is a very energetic blood-poison. It has for the hemoglobin of the blood about four hundred times the affinity of oxygen, and as little as 0.2% in air breathed will induce functional heart trouble; while the presence of 0.4% is fatal to animal life.

Metallic calcium, made at Bitterfeld, Germany, contains no phosphorus, but traces of silicon; the strong odor, noticed on cutting a fresh surface, is said to be due to silicon hydride. The sticks, in which form the metal is made, are covered with a yellowish or reddish layer of calcium carbonate which forms spontaneously and protects the rest of the metal within. The metal oxidizes, but will not ignite without the aid of a flame; it burns

naturally, with a brilliant red flame, with white edges. The metal has not yet shown the reducing power on organic or inorganic substances that is naturally and correctly anticipated; but this can mean only that the requisite condition or catalytic has not yet been found. It will be recollected that aluminum did not show its nature as a reducer until it was awakened by mercury; a similar agent is waiting for calcium. Its use in purifying metals must also be examined.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

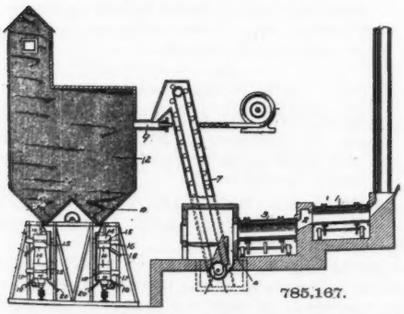
Week ending March 21, 1905.

785,093. ARTIFICIAL-STONE MOLD.—William C. Fox, Waterloo, Iowa, assignor to Iowa Gasoline Engine Company, Waterloo, Iowa. The combination of a bed, cores mounted thereon, a lifting-frame normally resting on said bed and surrounding said cores, guide-arms on said lifting-frame, lever mechanism whereby said frame may be lifted, end plates and side plates of a mold normally resting on said guide-arms of the lifting frame and pivotally supported from the bed, and means whereby the lifting of the frame raises the end plates and side plates through arcs.

785,139. ELECTRICALLY DRIVEN HOIST OR COAL-WHIP.—Johannes Wilhelmi, Hamburg, Germany. A block comprising a shell provided with means to connect it to an overhead support, a pulley, and an electric motor to drive said pulley, both contained in said shell.

785,161. PROCESS OF MAKING NITROGEN COMPOUNDS.—Adolph Frank, Charlottenburg, and Nikodem Caro, Berlin, Germany. The process of producing cyanide from carbides, which consists in heating, from a dark-red to a bright-yellow heat, a carbide that will not melt at these temperatures, reacting upon the heated carbide with nitrogen, then melting the product of the reaction and extracting the cyanide in the usual manner.

785,167. PROCESS OF SEPARATING AND REFINING COMPLEX ORES.—Eric Hedburg, Joplin, Mo., assignor, by mesne assignments, to



785,167.

American Reduction Company, Chicago, Ill. A process of treating ores, consisting in, first, drying the ores; second, roasting the same; third, subjecting the heated material to the action of a hydrocarbon gas; fourth, subjecting the material to an air-blast to partially cool the same; and, fifth, passing the same through a magnetic separator.

785,175. APPARATUS FOR CUTTING OR SAWING SLATE, STONE, METAL, WOOD, OR OTHER MATERIALS.—Charles Landale, Stoke-upon-Trent, England. The combination of a table for supporting the material, a saw-frame provided with one or more saws or cutters, cross-heads suspended between saddles by means of links for carrying said saw-frame, uprights carrying said saddles with screw-spindles working in said saddles and whereby the saws are fed to the work, and means for reciprocating the saw-frame.

785,210. PRESS FOR COMPRESSING AND DRAWING INGOTS IN CONICAL MOLDS.—Henri Harmet, St. Etienne, France. In a press, two rams arranged to press in opposite directions upon the ingot within a conical mold, a plug connected with one of said rams and arranged to enter the smaller end of the mold to guide said mold in proper vertical position, a support or head carrying the ram to which the plug is connected, an abutment projecting below the head and surrounding the plug to form a space for the reception of the plug, and a washer arranged in the head above the plug and forming a limitation for the upward movement of the plug in said head.

785,214. APPARATUS FOR EXTRACTING METALS FROM THEIR ORES.—Wilbur A. Hendryx, Los Angeles, Cal. An apparatus for treating ores, comprising a tank, means for continuously aerating the contents of said tank by lifting portions and distributing them in contact with the atmosphere, and electrodes within said tank.

785,263. MINING-DREDGE.—Allan G. Macdonell, Chevy Chase, Md. A dredge, comprising spaced floats and a transverse bridge carrying a rigid ladder-excavator, the bridge being longitudinally movable in the space between the floats, and means for moving the ladder forward and thereby forcing the excavator against the material to be dredged.

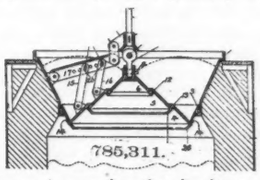
785,268. GAS-FURNACE-RETORT SETTING.—Glenn H. Niles, New York, N. Y. A setting for retorts, comprising column-sustaining and individual-retort-supportingwing-blocks,constructed and adapted to be individually removed without destroying the integrity of the column and coöperating binder-blocks.

785,272. MACHINE FOR MOLDING HOLLOW CEMENT BLOCKS.—Hezekiah A. Robbins, Bedford, Iowa. In a machine for molding hollow concrete blocks, a mold having a rigid side wall and a rigid end wall and provided with movable side and end walls, a movable bottom plate, means for moving the bottom plate outwardly from the mold, and devices for guiding such means in a direction diagonal of said mold.

785,302. EXCAVATING AND DREDGING MACHINE.—William Fullard, Plainfield, N. J. In a device of the character described, a frame or carriage, a boring-tool, an endless belt or conveyer, means for raising or lowering said frame and means for raising or lowering said boring-tool and conveyer independently of said frame.

785,307. APPARATUS FOR RAISING LIQUIDS.—Gustav Hantke, Warsaw, Russia. In a plant for raising liquids with the aid of compressed air, the combination with a plurality of liquid vessels, of means for charging said plurality of liquid vessels alternately or simultaneously with liquid, a plurality of storage vessels, means for charging said plurality of storage vessels, alternately or simultaneously, with compressed air under a varying comparatively high pressure, a pressure-reducing valve, means for arbitrarily conducting the compressed air from either a part or all of said plurality of storage vessels through said pressure-reducing valve to either a part or all of said plurality of liquid vessels, and means for allowing the liquid to pass from either a part or all of said plurality of liquid vessels to the pipe system.

785,311. DISTRIBUTING-BELL.—James B. Ladd, Wayne, Pa., and David Baker, Newton, Mass. In combination with a chamber, a distributing-bell comprising a plurality of sections



785,311.

and means for causing the simultaneous movement of said sections relatively to the chamber and to each other.

785,336. PUMPING-ENGINE.—Ole O. Storle, Tacoma, Wash. In a force-pump comprising a plunger-casing, a valve-chamber in communication therewith, a piston-cylinder and a rod connecting the plunger and piston in the casing and cylinder, respectively; an automatic cut-off for the piston-cylinder, comprising a two-part compartment in communication with the cylinder, two cup-shaped slides connected by a rod and fitting one in each of said compartments, and each provided with a stud projecting into the line of travel of the piston, said slides being adapted to be shifted alternately in the control of the live-steam and exhaust ports by contact of the piston with said studs, and to have their movement completed by the action of live steam on the slides.

785,352. DRILLING-MACHINE.—Robert M. Downie, Beaver Falls, Pa., assignor to Keystone Driller Company, Beaver Falls, Pa. In a drilling-machine, the combination with a supporting-frame, of a mast or derrick located at one end of the same, a drive-wheel supported on the frame in rear of the mast or derrick, spudding mechanism mounted on the frame between the drive-wheel and mast and including a crank located in substantially the same plane as the drive-wheel, a pitman for connecting the crank of the spudding mechanism and the drive-wheel, a walking-beam supported on the frame over the spudding mechanism and having its rear end above the drive-wheel, and another pitman for connecting the drive-wheel and the walking-beam.

785,379. ELECTRIC WELDING-MACHINE.—Adolph F. Rietzel, Lynn, Mass., assignor to Thomson Electric Welding Company, Lynn, Mass. In an electric metal-working apparatus, the combination of a starting device for causing current to flow through the section of work to be heated, an automatic cut-off for stopping the flow of current through the work, means connected with the work-holder for bringing the cut-off into action when, by the softening of the work, said work-holder has been permitted to move to a predetermined extent, and means for resetting the cut-off device by readjustment of the starting device to position for placing the apparatus in condition in which no current will be supplied to the work.

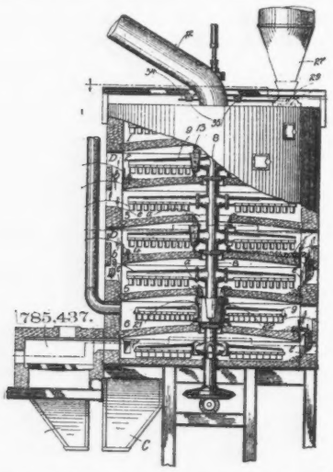
785,396. BITUMINOUS OR OTHER PITCH CONCRETE PAVEMENT.—Joseph H. Amies, Philadelphia, Pa. A process of procuring composition for bituminous and other pitch pavements, etc., which consists in using clean, suitably proportioned mineral matters, then sprinkling or pouring thereon a sufficient amount of water, then stirring them until the surfaces are dampened therewith, then sieving or throwing thereon finely granulated quicklime and the dust of hard asphalt and the flour of sulphur in due quantities, the said granulated quicklime and the dust of hard asphalt and the flour of sulphur having been previously incorporated together while in a dry state, then when the lime has begun to slake, sprinkling or pouring on the mass the due amount of unheated fluxing element, such as maltha or asphalt or other suitable oil, then mixing these all thoroughly together, then placing the same in a street or road bed or other desirable situation, then subjecting the whole to desired compression.

785,400. LOADING OR UNLOADING APPARATUS.—John D. Buchanan, Memphis, Tenn. A

frame formed of pivotally connected section, as conveyer carried by each section, and gearing connections between the conveyer-sections, said gearing connections being automatically disconnected when the sections of the frame are folded.

785,423. STAVE WOODEN PIPE.—James Hopkirk, Seattle, Wash. A device comprising a plurality of sections, some of said sections provided with inwardly projecting portions and a removable section secured between the projecting portion of said sections to form a continuous wearing-section of increased thickness.

785,437. ROASTING-FURNACE.—Charles H. Repath and Frank E. Marcy, New York, N. Y., assignors to Frank Klepetko, New York, N. Y. In a furnace having a plurality of superposed hearths, means for conducting the material from

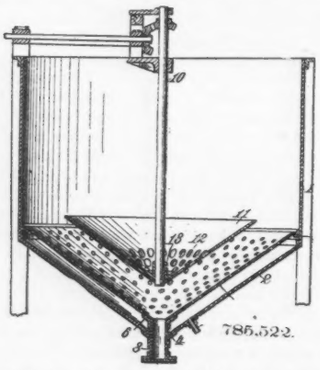


one hearth to the next hearth below in such manner that there is always an uninterrupted body of material connecting the material on one hearth with that on the next adjacent hearth.

785,480. BLASTING COMPOUND.—Frederick G. Dokkenwadel, Coshocton, Ohio, assignor of one-half to Harry M. Grant, New York, N. Y. A method of producing a blasting compound, which consists in shredding vegetable husks to small pieces, soaking them in sugared water, expressing the liquid until the husks are just damp, then covering the shreds with a mixture of pulverized sulphur, nitrate of soda, and nitrate of potash.

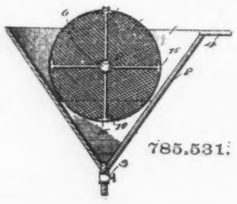
785,495. PROCESS OF ENRICHING EARTH.—Thomas C. Jeffries, Columbus, Ohio. A process of enriching earth, consisting in combining with a quantity of earth, predetermined proportions of strong sulphuric acid, lime and salt, the several ingredients being brought together in the proportions of 55% earth, 25% sulphuric acid, 15% lime and 5% salt.

785,522. ORE AGITATOR AND FILTER.—Verner A. Robinson, Florence, Colo. An ore-



agitator involving a receptacle, and an inverted-cone-shaped perforated rotatable agitator arranged within said receptacle.

785,531. ORE CONCENTRATOR.—Calvin G. Weller, Idaho Springs, Colo. In an ore-concentrator, the combination of a box for receiving the pulp, slime or material to be separated, a perforated pipe journaled in the box, arms projected from said pipe and forming open-work end sup-



ports, a rotary separating-screen mounted upon said end supports, the end supports being provided with grooved rims and hubs, the fabric of the screen extending over the grooved rims and hubs, annular binders for clamping said fabric to said rims and to said hubs, and means for feeding pulp to the box externally of the screen.

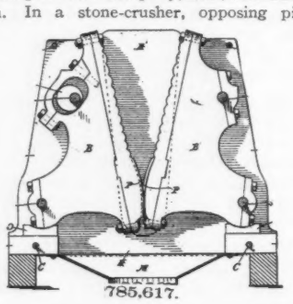
785,535. ELECTRIC FURNACE.—William C. Arsem, Schenectady, N. Y., assignor to General Electric Company. An electric furnace having an air-tight chamber, a refractory heater therein, means for supporting material to be heated in close proximity to said refractory heater, and means for exhausting the air from said chamber.

785,562. COMPOSITION OF MATTER ENTERING INTO THE CONSTRUCTION OF FOUNDRY APPLIANCES.—Aaron R. Marsteller, St. Louis, Mo. A composition of matter for foundry use and the like, consisting of sand, oil, litharge and asphaltum.

785,565. AMALGAMATOR.—Patrick McEntee, Spokane, Wash. An amalgamator comprising a sluice having amalgamating-plates, means for feeding material to be treated, together with water and mercury, to the sluice, a collector into which the sluice discharges, said collector having means for separating the water and tailing from the amalgam, and the free mercury from the latter, and means to return the recovered mercury to the sluice for re-use therein.

785,569. EXTENSION-CONVEYER.—David D. Plunket, New Southampton, England. An extendable conveyer comprising a movable or extendable frame mounted and free to telescope on a main or carrying frame, said frame being of such length that its discharge end projects beyond said main frame even in its most retracted position.

785,617. STONE-CRUSHER.—George S. Knapp, Grand Rapids, Mich., assignor to Differential Ore Crushing Machine Company, Ltd., Grand Rapids, Mich. In a stone-crusher, opposing pivoted



jaws, one of said jaws having a slotted or elongated opening, a driving-shaft and eccentric in said opening, adjustable eccentrics on the shaft and means for connecting said adjustable eccentrics with the other jaw to operate the same.

785,630. CONVEYING MECHANISM FOR FURNACES.—William McClave, Scranton, Pa., assignor to McClave-Brooks Company. A conveying mechanism comprising a duct, approximately U-shaped, in cross-section having a bottom formed with a central curved portion, and inclined side portions extending therefrom and side walls extending upwardly from the inclined portions of the bottom, the side walls affording ample capacity for material above the conveyor, a conveyer moving in the duct, the said conveyer engaging only the curved portion of the floor, and means for operating the conveyer.

785,634. WATER-JACKETED BLAST OR OTHER FURNACE.—Anthony Patterson, Cardiff, England. The combination with the casing or wall of a furnace, of a series of troughs adapted to be secured thereto, each trough being so shaped as to fit against the wall of said furnace and open at the top and one side, and provided with a depression at its top for overflow purposes located near one end thereof, and a channeled plate secured to the outside of said trough substantially parallel to said trough and of substantially the same depth, whereby a conduit for the overflow water is formed, said troughs being so arranged that said conduits are located at opposite ends of the troughs located in successive rows around the casing of the furnace, whereby a circulation of the water in a zigzag path is effected.

785,637. PEAT-COMPRESSING MACHINE.—Carl Schlickeysen, Steglitz, Germany. In a peat-compressing machine, the combination of a feed-hopper, bow-shaped, means arranged in said hopper for separating portions of peat from the peat mass fed into the hopper, and means for kneading and compressing the peat.

785,650. PITCH-CEMENT CONCRETE PAVEMENT.—Joseph H. Amies, Philadelphia, Pa. An improvement in procuring compositions for pavements which consists in securing a practical method of combining desired elements in necessary proportions to secure needed results, viz.: taking a due quantity of granulated quicklime and mixing it with a sufficient amount of water, then adding thereto and mixing therewith a required measure of the described asphaltic cement, thus producing the active fomentations desired, then immediately taking advantage thereof to make it possible to add thereto and mix therewith the necessary quantity of mineral matters, thereby enabling the practical mingling of the said ingredients, in batch quantities, and by hand-labor, if desired, then at once placing this mass upon a properly prepared street or road bed, rolling and tamping it to secure desired compression.

785,696. PROCESS OF PRODUCING BLACK OR DARK CARBONACEOUS PIGMENTS.—David J. Ogilvy, Cincinnati, Ohio. A process of producing black or dark-colored pigments by impinging carbonaceous flames, produced on a moving source, on water in a stationary condition.

785,697. PROCESS OF PRODUCING BLACK OR DARK CARBONACEOUS PIGMENTS.—David J. Ogilvy, Cincinnati, Ohio. A process of producing black or dark-colored carbonaceous deposits, by impinging carbonaceous flame, produced on a stationary source, on water in a stationary or quiet condition.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending March 4, 1905.

7,148 of 1904. ADJUSTABLE STRUT.—F. Sommer, Essen, Germany. An improved telescopic strut for use in mining, capable of being adjusted to any required length.

7,186 of 1904. MINE CAR COUPLING.—E. H. Mawson and Jit Pugh, Cardiff. Improved coupling for colliery cars.

12,707 of 1904. BLASTING POWDER.—Chemisch-Electrische Fabrik-Prometheus, Frankfort, Germany. A method of agglomerating powder of carbide of silicon, etc., into a coherent mass.

24,781 of 1904. REDUCING ALUMINA.—H. S. Blackmore, New York, U. S. A. In reducing alumina by the electric current, melting it in a bath of more easily melted metallic oxide having a greater affinity for oxygen than aluminum.

Special Correspondence.

San Francisco. March 29.

One of the things which has damaged the mining industry in this State, as well as other States, has been fake mining companies, which, by wide advertising, exaggerated reports, paying 'dividends' out of stock sale, etc., have swindled inexperienced people. More or less discredit has always been cast upon the business of mining by such companies, for those who were swindled afterward characterize all mining transactions as dishonest. It seems very difficult to convict the people carrying on such concerns, and even when convicted they manage by technicalities of the law to escape punishment. One man in California, for instance, obtained several hundred thousand dollars from subscribers to stock in his mining company by fraudulent representations, and was convicted a year ago for misusing the mails, but by appeals, etc., he is still at large, and may be for another year or more. Meantime all the stockholders are out of their money, and will never be able to recover it, as the mine is worthless. No dividends were ever paid from the mine itself, but were paid from sales of stock to others.

In an effort to stop further fraudulent representations on the part of such schemers, the State Legislature recently enacted a law by which any superintendent, director, secretary, manager, agent or other officer of any corporation formed or existing under the laws of this State, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent or other officer, who shall wilfully subscribe, sign, indorse, verify or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation, or its stock, any untrue or wilfully and fraudulently exaggerated report, prospectus, account, statement of operations, values, business, profits, expenditures or prospects, or other paper or document intended to produce or give, or having a tendency to produce or give, to the shares of stock in such corporation a greater market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and on conviction thereof shall be punished by imprisonment in State prison or a county jail not exceeding two years, or by fine not exceeding $5,000, or both.

This new law strikes at the root of things, particularly in the matter of exaggerated prospectuses and advertisements. It makes the acts referred to a felony instead of a misdemeanor, and provides an adequate punishment. It will no longer be necessary to wait for the United States postal authorities to act, but it is competent for any citizen to bring the facts to light and stop further misrepresentations, as well as to punish the men. The new law is quite an advance in the matter of protection against fraudulent mining companies.

Another good thing done by the Legislature at its recent session was to appropriate $5,000 for the purpose of procuring metallic guide posts, upon which are to be indicated the distance and direction from said posts, the location of wells, springs or tanks of water fit for drinking purposes, and other information of value, in the desert sections of California, particularly in the counties of Kern, Ventura, Los Angeles, Inyo, Riverside, San Bernardino and San Diego; providing, however, that each of said counties (for its own county) shall bear the expense of the proper erection of said guide posts at such points in the county as may be designated by the department of highways, and shall pay all expenses attendant upon the placing of said posts, as well as the expense incurred in placing the directions upon said posts.

In the Mohave, Colorado and Death Valley desert districts in southern California and southeastern California there are wide areas where water is only occasionally to be found. The roads and trails through the sand and sagebrush are often obliterated by wind storms, and it is hard to find the way or to find water. For years efforts have been made to have official guide posts provided, and some of the southern counties have erected wooden ones at certain points. They are by no means generally adopted, however, so that the carrying out of the new law will be of great benefit to prospectors and miners in those desert regions. Hundreds of men have perished from thirst through not being able to find the springs, tanks or water holes, so it has been a dangerous thing for strangers to attempt desert prospecting. The guide posts will serve a very useful purpose.

Denver. March 31.

In the Supreme Court of the United State a petition for writ of certiorari has been filed by the Stratton's Independence Co. in its suit against the Stratton estate, which was decided in favor of the latter in the Circuit Court of Appeals.

The lessees operating on Block 36 of the Anaconda mine at Cripple Creek have opened a large orebody similar to that which was found in the main Anaconda vein some years ago.

Since the leasing system has been introduced largely in the Cripple Creek district, several have become regular dividend-payers, and nearly $260,000 was distributed in that manner during the past month.

The Stratton's Independence contributed about one-half of this total. This makes the total dividends from the district since the beginning of the current year over $735,000.

A strong syndicate headed by several prominent Colorado Springs parties has closed a deal with the executors of the Stratton estate for a lease on a number of blocks, including the famous John A. Logan mine, which has been worked already to a depth of 1,500 feet.

A plan for compulsory investigation, looking to voluntary arbitration of labor difficulties, was proposed by the Denver Trades and Labor Assembly a few days ago which, if it is carried out, would prevent strikes and lockouts in the near future, as far as the State is concerned.

It is the intention of the owners of the Bankers' National group of mines, near the Camp Bird mines at Ouray, to build a mill this summer, and exploration work is being prosecuted.

A franchise has been asked by a Baltimore syndicate to operate an electric car line by the new mono-rail system, which is thus far unknown here, one rail with two trolleys being used. The J. George Leyner Engineering Works, which are in course of construction near Littleton, are expected to furnish the power.

It is reported that A. W. Geist, one of the builders of the original Pueblo plant of the American Smelting & Refining Co. at Pueblo, and, of late years, largely interested in Mexico, has interested a number of Colorado and New York capitalists for the building of a railroad from Ameca, the terminus of the Mexican Central railroad, to Banderas bay on the Pacific, and that F. M. Ames, who is a well-known locating engineer, is making a preliminary trip over the proposed line.

David H. Moffat has returned from New York, and announces that construction of his road toward Salt Lake City will continue vigorously. The Denver & Rio Grande railroad intends to double-track between this city and Pueblo, make large improvements at Colorado Springs and build shops at Pueblo on account of largely increasing business.

Houghton. April 1.

With the opening of navigation at copper country ports close at hand rail shipments of refined copper from the Michigan mines continue heavy, and there is very little metal of any description on hand at the wharves of the smelting plants. This is a strong commentary on the metal situation, and denotes urgent demand for supplies from the consumers. Every indication points to an early opening of navigation at local ports this spring, but the first lake steamers will find comparatively little copper awaiting shipment.

The Quincy Mining Co. has begun to accumulate supplies, but rail shipments from its smelter also continue, some orders being on hand which necessarily have to be filled. The Quincy smelter is working full capacity, and has been turning out an unusually large product during the last few months. The new furnace is giving satisfactory service and the facilities for handling the very large amount of custom work which is being done are fully adequate. Besides its own mineral, the Quincy smelts the product of the Franklin, Adventure, Mass Consolidated and Centennial mines.

At the plant of the Michigan Smelting Co., which is owned by the Stanton-Paine mines, the difficulties which retarded operations ever since the furnaces were blown in have been entirely eliminated and the service is satisfactory in every detail. The entire production of the Copper Range Consolidated mines—Baltic, Trimountain and Champion—is being treated, and upon the expiration of the contracts of the Wolverine, Mohawk and Atlantic companies with the Calumet & Hecla Mining Co. the output from those properties will also be handled. The present capacity of the Michigan smelter is 72,000,000 lb. fine per annum, but the management has under consideration plans for additions which will largely increase the capacity. Eventually the Michigan smelter will treat the product of the Champion, Wolverine, Baltic, Trimountain, Mohawk, Phoenix, Michigan and Winona, the latter's as soon as it resumes production. Throughout the past winter the Michigan smelter has been forwarding its product to the Eastern market as fast as smelted. Copper is now being accumulated for the first lake vessels, but no considerable amount is on hand.

At the smelting plant of the Calumet & Hecla Mining Co. at South Lake Linden the usual stock of high-grade mineral has been accumulated for summer shipment to the Eastern smelting plant, at Buffalo, but other than this rough copper—the product of the stamp mills, with its adhering gangue of rock—there is practically no metal on hand. During the last few months the Calumet & Hecla has been smelting the product of some of the Stanton mines, and the great improvement in the product of those properties bespeaks

the highest praise for the excellent management of its smelting department.

There is no copper to speak of at the Dollar Bay docks of the Lake Superior Smelting Co., and during the past season the product has been shipped by rail as fast as turned out. Lately considerable metal has been sent west to fill orders from China, and one week last month 720,000 lb. were shipped to Seattle, there to be transferred to ocean steamships for shipment to Shanghai. Japan and China have been good customers of the lake mines for a considerable period.

Owing to the withdrawal of the mineral consignments from the Copper Range Consolidated mines, which were necessarily shipped there during the period of repairs to the Michigan smelter, the Hancock plant of the Lake Superior Smelting Co. has been closed down. Whether permanently is uncertain, but it is not likely that the plant will be operated again, unless the conditions absolutely require such a procedure. The Hancock plant, known as the Portage Lake Smelting Works, was the first built in the Lake Superior district, and began refining copper in 1861. It was purchased by the Lake Superior Smelting Co. in 1890 and consolidated with the Dollar Bay plant, and this corporation passed into the control of the Tamarack and Osceola mining companies in 1898. The Hancock plant is antiquated and inferior to the Dollar Bay plant of the same concern. It has been used in late years only when the capacity of the latter plant has been overtaxed.

Scranton. April 4.

The first of April was generally observed by the anthracite miners as a holiday. Very little coal was mined.

As was the case with other anthracite coal properties, the Delaware & Hudson did not enjoy as favorable a year in 1904 as in that preceding it. The decrease was, however, comparatively small, and was due more largely to local circumstance than to any general depression in the coal business of the company.

Breaker No. 9, owned and operated by the Lehigh & Wilkes-Barre Coal Co. at Sugar Notch, was completely destroyed by fire on March 29. The fire broke out in the bottom of the breaker, near the engine room, from some unknown cause. The discovery was made about 15 minutes after the breaker had closed down for the day. The loss on the building and improvements will reach $60,000, partly covered by insurance. The breaker had an output of from 1,300 to 1,400 tons daily, and gave employment to about 600 men and boys, who will now be idle. The breaker will be rebuilt as soon as possible.

That there is still virgin coal in the anthracite district is often demonstrated. Some Archbald men seek to purchase the right of mine coal under the central portion of Archbald borough, where the coal remains in its original state. This valuable property has never been mined, because the Delaware & Hudson company years ago, when it sold the surface, did not reserve the right to mine the coal underneath. It is therefore owned by the people who own the surface. The discovery of a vein of coal in Panther's bluff, along the Honesdale branch of the Delaware & Hudson Co., east of Simpson, also bears out the conclusion of the existence of virgin coal in this section of the State. Whether there is much coal there or not is yet to be determined, as the men who have secured this tract of land are now prospecting it. If a well-established vein of coal is unearthed here, it will be found in a territory never suspected before of concealing anthracite. The same men who are interested in the development of the Panther's bluff section have purchased 122 acres of hitherto unworked coal lands along the "Wild Cat" road in Archbald borough, from the Whitlock estate, and propose to operate it. They have found two veins, and it is believed they are rich in mineral.

A mine fire is in progress at No. 4 colliery of the Erie Co., at Port Griffith, and the colliery was forced into suspension on March 25. A foreigner employed as a miner set off a blast when he finished work, and left without returning to his chamber to see the result of his charge. It is thought a pocket of gas became ignited at the time. Nothing was known of the occurrence until early March 26, when the fire boss in making his rounds discovered the coal pillars on fire. Aid was immediately summoned, and the men were at work all day fighting to check the progress of the flames. Having been undiscovered for so many hours, the flames had gained considerable headway.

On April 1 the Lackawanna company located the site of the new Diamond breaker, preliminary to the building of the new structure. The breaker will be on the easterly side of the main tracks, a little south of the old shaft and north of the Mount Pleasant colliery, but on the opposite side of the railroad. The plans have been completed for the breaker, and as the weather is now favorable, building operation will be commenced at once. It is expected that the breaker will be completed and in operation before the end of the year. The coal from the two shafts, the slope and the drift, will be hauled over the narrow-gauge road and then taken to the top of the breaker by means of conveyers. As soon as the new structure is in operation the old breaker will be torn down.

Duluth. April 2.

Iron ore roads on Lake Superior are hauling ore for the season of 1905, having begun during the week of March 26, and are taking from many mines the daily hoist. Ore is going to docks at Duluth and two Harbors, Ashland and Marquette, but there is no large movement yet, and cannot be until the steam shovels are started in open-cut mines and in stockpiles. There has been no change in the situation as to chartering, and very few new charters have been made the past few days, for vesselmen, as a rule, are chary of chartering late in the year. They are looking for a possible large grain movement the coming fall, and if they are not disappointed there will be higher freights than the figure they have chartered under. For two or three years past grain promises have not been fulfilled by the crop, but conditions so far are excellent for a big crop, and the seeding of the Northwestern wheat region is now progressing at a rapid rate, far earlier than it has ever been known. No ice remains at the head of Lake Superior, very little at the eastern end of the lake, and the lower lakes are reported as nearly ready for big ships. Vessels will be at ore docks loading cargoes by April 3 or 4, but there can be no arrivals from lower lakes for a week later. A good many ships nowadays always tie up for the winter at Duluth, and these will be the first to load and get away.

The State is instituting a suit that may have an important bearing on the ownership of State leases in Minnesota in future. It grows out of the status of the little sliver of land north of the Sauntry mine, lying like a thin wedge between townships 58 and 59. This was overlooked in the original survey, and when finally adjusted the land was claimed as swamp by the State, under the provisions of its organic act. This claim was fought out and the State won. Upon this it was leased to a Mabel Evans, who was later reported to be in the interests of two clerks of the State Land Office, who, by virtue of their positions, were not permitted to take State lands. However, Miss Evans holds the lease. The land is supposed to be valuable. It adjoins the opened portion of the Alpena-Sauntry, and should contain iron ore. It is not too narrow to make a mine, and is half a mile long, east and west. Now comes the State attorney and enters suit to cancel the Evans lease, and bases his action on two grounds. The first of these is the claim that the lease was taken for the benefit of State employees. This is denied, under oath, by all connected with the matter, and is a matter of but minor moment, anyway. The real difficulty with the situation lies in the other aspect of the case, and this may have an unsettling effect far beyond expectation on all State mineral leases. The State Constitution, Article 2, reads that all State lands shall be sold at public auction. Now these mineral leases are virtually a sale of the ore in the land, and are therefore to be regarded as sales. They are, under the State mineral act, not sold at public auction, but at private sale to the first applicant, and if there is a conflict of applications, not even then at public sale, but at auction between the original applicants. If, therefore, mineral leases are unconstitutionally issued it follows that they must be canceled. This is the position of the State attorney, but he does not appear to see what will follow. If the leases have been illegally issued and are canceled, the State must refund the money that has been paid for them, the royalties that have been received by it under them, and the fees that have been paid it for 50-year contracts.

Salt Lake City. March 31.

The directors of the Utah Copper Co., at their recent meeting, authorized D. C. Jackling, the manager, to proceed forthwith with the building of a gigantic concentrating mill and power plant at a point about 15 miles west of Salt Lake City, near the old Garfield Beach resort. Here a plant with capacity for the treatment of 6,000 tons of ore daily will be erected. A standard gauged railroad, the total length of which will be about 17 miles, will connect the company's mines with the mill. It is understood that a close alliance has been made with the San Pedro, Los Angeles & Salt Lake railroad and the Copper company, and that the San Pedro will take advantage of the opportunity to get into the big copper company with a branch. At present the camp is reached only by the Denver & Rio Grande. The Copper company has also decided to increase the capacity of its first mill, now in operation in lower Bingham cañon, from 800 to 1,000 tons, which, with the new mill, will give the Utah Copper equipment sufficient to reduce to concentrate a total of 7,000 tons a day. The significance of this lies in the fact that by the time the new equipment is ready the mines of Bingham will be called upon for a tonnage equal to twice the present production. The plant is expected to be ready within a year. With the other companies having in contemplation substantial enlargements, the mines of Bingham should be producing anywhere from 12,000 to 15,000 tons of ore daily within the next year. With its new equipment,

the Utah Copper will produce close to $500,000 monthly, or $6,000,000 per annum, thus leading any other mine in the State.

The ore and bullion settlements reported by Salt Lake banks last week aggregated a total $496,100.

Spokane. March 28.

The Hayden Creek Mining & Milling Co., backed by Iowa capital and operating a copper property near Rathdrum, Ida., held a meeting this week, when T. J. Fitzsimmons, of Tracy, Ia., was made president, and T. J. Bray, of Grinnell, Ia., secretary. Arrangements were made to install a compressor and drills.

Eastern Oregon is much excited over a strike on the Belmont group, near the Morning mine in the Greenhorn district, where three men in four days cleaned up $3,000 from a rich sugar quartz.

The Custer group, near Wallace, Ida., is taking out considerable fine concentrating ore, and hand-jigging will be resorted to, for getting a shipment of 100 tons.

The Great Western mine, a Galena property, near Nespelim, Wash., is showing favorably under development. M. L. Pershall, the president, who is back from a visit, reports that 5½ ft. of galena on the hanging wall averages $65, and on the foot wall 15 ft. run $20 to $25 a ton. The mine is equipped with a 25-h. p. steam plant and steam drill.

The Northern Montana Oil Co., of Spokane, which was formed three years ago during the oil excitement in the Kintla Lake district of northwestern Montana, has issued a notice to stockholders advising that the company dissolve and abandon the field. The trustees say that the district has not fulfilled expectations.

Frank Brown, manager of the Jumbo mine at Hump, Ida., reports that the chlorination plant just completed is a success, and is saving more than 95 per cent of the values. There are only 4 ft. of snow in the Hump and none at the Jumbo mine.

W. Y. Williams, of Spokane, formerly superintendent of the Granby company's mines, is in Italy on his European tour.

The Kendall mine at Kendall, Fergus county, Mont., controlled by the Finch & Campbell interests of Spokane, has paid dividends of $730,000 since Christmas, 1902. It is a low-grade gold property. It is not four years since Finch & Campbell bought control of the property from H. T. Kendall on a valuation of $400,000. They equipped it thoroughly with profits, which are not included in the dividend statement. The capital is $2,500,000 in $5 shares, and stock is selling around par. Counting the present stock valuation and the dividends, the mine has returned eight dollars for one in four years.

Several carloads of machinery for the extensions of the Granby smelter at Grand Forks, B. C., have arrived. A. L. White, of Spokane, one of the heavy owners of Granby, who is back from an inspection of the property, reports that work is progressing rapidly.

Heavy rains in eastern Oregon have made roads almost impassable, and have seriously interfered with shipments of ore over the mountain roads to the Sumpter smelter. The Snow Creek mine is giving all its attention to driving the cross-cut from the 200-ft. level of the main shaft, and the rebuilding of the mine houses that were burned a week ago.

The Hecla mine, operating near Burke in the Coeur d'Alenes, has declared its monthly dividend of one cent a share. It amounts to $10,000, and makes total dividends of $340,000.

Reports that the Federal Mining & Smelting Co. is negotiating for the Bunker Hill & Sullivan mine near Wardner, Idaho, have elicited the following from Fred W. Bradley, executive head of the Bunker Hill company: "I know of no negotiations for a majority of the Bunker Hill stock, but there has been some flirting for small stock holdings. The double dividend of $150,000 recently declared will not be repeated regularly."

Hoisting machinery for the Ben Hur mine at Republic, Wash., has been started.

Smelter returns from 20 tons of ore shipped by the Ben Venue mine near Kettle Falls, Wash., gave values of $42 in gold and $3 in silver.

The Interstate Mining Co., an Ohio corporation, operating near Chesaw, Wash., has bought the Reckless claim adjoining the company's property on Copper mountain, from Spokane people. Superintendent Henry Thompson announces that the mill will be enlarged.

Deadwood. April 1.

The Canton Mining & Milling Co. of Hill City has received a consignment of machinery, which will be installed at once. The lot includes a steam hoist, sinking pump, Blake crusher, ore feeder, boiler, etc. The company will erect a small test plant, having leased a set of fine crushing rolls from the Harney Peak Co. Straight amalgamation will be employed in saving the values. The company's property is a mile and a half west of Hill City.

The Sunflower Mining & Milling Co., which is operating a property at Hill City, held its annual meeting last week at that place. The following directors were chosen: Christ Baysel, G. W. Icken, C. B. Liver, Omaha; M. C. Christensen, O. Younkermann, W. H. Jalling, George S. Davis, Council Bluffs, Iowa.

E. C. Johnson, promoter of the Gertie Mining & Milling Co., Hill City, has arranged with local parties to exchange labor and supplies for Gertie stock, and is erecting a two-stamp Tremain mill to handle the tin-gold ores the property contains. Work is progressing favorably, and the plant should be in commission by early summer. The mine is developed to 500 ft. depth, with ore in sight in the bottom and at intermediate levels.

The W. & M. R. railway, which is to be completed this summer from Rapid City to Mystic, is destined to open a valuable mineral territory. Different properties which have been opened up in the district show a variety of minerals—from iron to gold. Manganese, traces of cinnabar, which may eventually develop mines; antimony, silver, lead, arsenic, etc., are among the lesser minerals which have been developed to some extent. Work is now in full blast on the road. Messrs. Willis and Detwiler, of Terre Haute, Ind., who have the contract for grading and laying steel, have a large crew of men and teams. Headquarters have been established at Pactola, half way between Mystic and Rapid City. Large warehouses and office buildings have been erected at Mystic. The work will be done from that end of the line. The road follows along Rapid creek the entire distance of 40 miles.

Placer mining promises to be quite active on Rapid creek this year. L. A. Richards, Pactola, McCurdy Bros. and J. C. Sherman, all at Pactola, are arranging for an active season. Mr. Richards is constructing a two-mile ditch and flume, which will give an unlimited amount of water at 100-ft. head for hydraulicking. The Quaker City Co., on Castle creek, has a plan for draining six miles of that stream by driving a tunnel two miles in length. The Elkhorn Mining Co. and the Black Hills Electric Power & Mining Co. own placer ground near Silver City, on Rapid creek. In addition to these active concerns, there are any number of individual claim owners who gain a livelihood during the summer by working their claims.

Leadville. April 1.

The Fannie Rawlins, on Breece hill, is shipping about 500 tons a month of a good grade of silicious and oxide ores. The ore was found in a drift to the south from the bottom of the shaft, 400 feet.

After the connections were made between the Elk and the Rattling Jack, work was started at the bottom level, and the ore found in the upper levels has been opened. The body is not large, but what it lacks in quantity is made up in quality, as the first class ore runs 12 oz. gold per ton. About 40 tons a month of this ore is being shipped.

After 26 years of active mining the Evening and Morning Stars is still producing 100 tons daily of an excellent grade of iron. In addition to the work done by the company several leasers are at work and doing well.

The lower drift on the Mountain Lion, Ball mountain, is being pushed ahead rapidly, and the lessees expect, within a few days, to catch the main body of ore. Several other claims on this hill adjoining the Sunday are pushing work, and a number of them will be on the shipping list before all of the snow is gone.

On account of the inability of the smelters to take all of the product from the Yak tunnel mine only 7,000 tons per month are being shipped at present. With a market for the output the mine could produce 12,000 tons monthly. It will be six weeks yet before all of the machinery for the new mill is in place, but when the mill does start it will turn out 250 tons of concentrate daily. The new sampler is working and giving entire satisfaction.

At the Lecompton tunnel the breast is in 350 ft. and the ore still holds good. The tunnel has left the Lecompton ground and is now in territory belonging to the Nisi Prius people. It is the intention of the lessees to drive the tunnel ahead as long as the ore stays with them. When it peters out then stoping and sinking of winzes will be started toward the portal.

Toronto. March 30.

The Ontario Bureau of Mines has received for its collection of minerals a nugget of native silver, about 26 in. in length by 12 in. in width and 2 in. in thickness, weighing 80 lb., taken from the Trethewey silver-cobalt mine near Cobalt, on the Timiskaming railway. It is estimated to contain from 55 to 60% of silver, and its value is about $380. Since the discovery of the deposits in this neighborhood some $500,000 worth of ore has been shipped. No details have so far been received as to the new discoveries of silver-cobalt ore further to the north, but they are believed to be very rich. Willet G. Miller, provincial geologist, lecturing on March 18 on the 'Silver and Cobalt Ores of Timiskaming' before the Canadian Institute of this city, referred to the new finds which he regarded as authentic, as the same rocks occur in a wide range in that part of the province. The rock is a characteristic slate and conglomerate. These deposits, he

stated, were only about eight miles from one of the oldest known mineral deposits in North America, known as the Wright mine, which was discovered by the Jesuits or early explorers on Lake Timiskaming during the French régime. The richest silver deposits heretofore worked were those of the vicinity of Thunder bay, Lake Superior, the best known of which—Silver Islet mine—had yielded $3,000,000 in silver. These were about 500 miles west of the silver-cobalt deposits of Timiskaming, and it was reasonable to suppose that there were others to be discovered in the intervening territory, which had never been prospected. The Timiskaming deposits were 'poor man's diggings,' no plant being necessary, as the ore was near the surface and only had to be dug out.

A gold-mining company under the name of the Big Dipper Mining & Milling Co., is being organized at Peterborough, Ont., with $2,500,000 capital to carry on development work in Barrie township, Frontenac county, where it has 1,934 acres of mineral lands through which a vein of gold runs. The company will also engage in iron mining. The officials are S. Sager Peterborough, president; J. M. Fletcher, Buffalo, vice-president; J. S. Waldron, Jackson, Pa., secretary; J. A. Jamieson, of Myres Cave, formerly of Colorado, superintendent.

Judge Teetzel pronounced judgment here on March 27 in an action brought by the Bullion Mining Co. against Sir Richard Cartwright, a member of the Canadian Cabinet, for $3,000 subscription due on shares. The case was the outcome of the ill-fated gold mining boom of six years ago, when, in the language of the judge, "the frenzied cupidity of the public was being largely 'mined' by promoters." The Bullion Mining Co. was organized in 1899, Sir Richard being an extensive shareholder. They owned two locations near the Mikado in New Ontario, and organized a subsidiary company known as Bullion No. 2, to develop them, in which Sir Richard subscribed for 60,000 shares at 10c. each, the nominal value being $1 per share. He gave two promissory notes of $3,000 each in payment; one of these was met at maturity and the second renewed from time to time. The scheme collapsed, the locations were never transferred to the subsidiary company, and Sir Richard finally refused to pay the $3,000, pleading that no consideration had been received. The judge decided in his favor and dismissed the action, and also ordered the company to return him the $3,000 paid to retire the first note.

W. J. Hardinge, manager of the Massey Station copper mine, who was in Toronto this week, reports that the Elmore oil concentrating process installed at the mine is working satisfactorily.

London. March 25.

The report of the United Alkali Co. for the year 1904 is as disheartening as ever to the holders of the ordinary shares. This is the eighth year in succession for which no dividend has been paid, and the question once more arises as to the desirability of rearranging the finances of the company. The net profits during the 13 years of the company's existence have been large; with the exception of the first year, when they amounted to over £800,000, they have kept fairly steady at about £350,000 per annum. There are debentures which take £130,000 in interest, and cumulative preference shares which require £188,000, both of which have to be satisfied before the £3,000,000 worth of ordinary shares receive anything. Judging by the records of the past 10 years, it would appear that present circumstances are not exceptional, but quite normal. German, and to some extent American, competition is such that there is no hope of any permanent rise in prices. In some quarters the fact that the various members and individuals of the combination sold out to the company when chemicals were high priced, and with the shrewd knowledge that growing German competition would subsequently depress the English chemical trade, is freely commented on, but this is not a criticism which helps at all, and does not go to the root of the matter. It is not at all certain that the chemical manufacturers, who were parties to the deal, are any better off than they would have been if the total purchase price of the various businesses had been only half what it actually was. They may be receiving at present more debenture interest and preference dividend than the position of the company warrants, but the capital value of their debenture and preference shares is reduced by the lack of security. Also the continual strain to keep up the net profits and so pay the whole of the preference dividend is working to the detriment of the capital value of the company. Very little is being written off for depreciation, and the funds at the disposal of the directors for keeping the various works up to date and adopting new processes are necessarily restricted. The directors take no steps to rearrange the finances, as they consider that the rights of the debenture holders are inviolable. I would point out the case of the Rio Tinto Co., whose debentures were cut down from 5 to 4% 10 years ago. Before that time neither the debentures nor the ordinary shares were of the highest standing. Since the reorganization of the finances in 1895, both classes have enjoyed a well-deserved reputation. There is no reason why a similar reorganization of the United Alkali Co. should not improve the position of the debenture holders and preference shareholders as well as that of the ordinary shareholders.

A week or two ago I mentioned the case of the Chinese Engineering & Mining Co., in which the work of English and German brains and capital had been exploited by the Chinese authorities, and afterward the control and management had been re-obtained by the Chinese by bringing an action in the English courts for the specific performance of an agreement, which nobody expected would ever be enforced. Attention has been drawn by this case to similar English enterprises in China, and both directors and shareholders have been looking up records to see if there are any Chinese agreements lurking in the background. One of the most important of these enterprises is the Pekin Syndicate, which was formed in 1897 by Carl Meyer (once of the Rothschilds), to acquire coal, iron and petroleum rights in the province of Shansi. This company has already completed railways and docks and has opened up iron and coal deposits. In a short time the coal output will be 2,000 tons a day, and blast furnaces are being designed to produce 200,000 tons of pig iron per annum. The company works in conjunction with several other companies which undertake steamship, tramway and railway projects in China and adjoining countries, and is very well provided with capital. It is sincerely to be hoped, now that the company has spent so much money and has nearly reached the profit-earning stage, that it will meet with no 'Chinese' difficulties.

Victoria. March 30.

The Wellington Colliery Co. lately made a change in the working arrangements at its Extension colliery. Until recently there were employed in this mine 425 miners and about 400 pushers, drivers, etc., in all some 825 men, all white labor. Henceforward the principal part of the mining here is to be done with one shift, a second shift working but few men. It is understood that the amount of the payroll will not be lessened, but the men employed will work every day, and not intermittently as they have been doing. Between 100 and 200 men will probably have to find employment elsewhere.

Notwithstanding that there has been a general impression that the provincial government is not disposed to support any movement in the direction of amending the mining laws of the province, representatives of the placer miners of both Cariboo and Atlin districts are urging the mining committee of the local legislature to recommend certain amendments, prominent among which is the crown-granting of placer claims. Petitions from both many individual miners and companies operating in those districts, which are the chief placer-mining sections of the province, have been received, and it is noteworthy that numbers of miners heretofore opposed to this concession are now urging that it be granted, there having been a steady extension of the conviction that fixity of tenure alone will encourage the investment of more outside capital in placer mining in the province, a field of operations worthy of careful investigation.

Nelson.—Smelter returns from ore shipped by the Arlington mine, Erie, in the Nelson mining division, to the Hall Mining & Smelting Co.'s smelter during two months, are as follows: January; shipped 129.4 tons of ore, gross contents of which were: Gold, 404.735 oz.; silver, 771.25 oz., and lead, 8,372 lb. Average contents per ton were: Gold, 3.128 oz.; silver, 5.95 oz., and lead, 54.7 lb. Net smelter returns amounted to $7,012.44, and expenses, including development, to $4,107.22. February; shipped 289.27 tons of ore, gross contents of which were: Gold, 837.2 oz.; silver, 1,635.5 oz., and lead, 19,057 lb. Average contents per ton were: Gold, 2.894 oz.; silver, 5.6 oz., and lead, 65 lb. Net smelter returns amounted to $14,347, while expenses, including development, were $4,391. The mine is owned by the Hastings (British Columbia) Exploration Syndicate, Ltd., of London, England, and prior to Leslie Hill taking charge of it about two years ago, operations over a comparatively long period resulted in loss. The operations of the first two months of this year, however, show an encouraging profit.

The B. C. Standard Mining Co., of Nelson, working the Hunter V. and Standard mines, in the Ymir district, made a small loss during the year 1904. The accounts submitted to a meeting of shareholders showed that after making a charge for wear and tear of tramway cable and for plant depreciation, there had been a loss of $3,400 on operations for the year on shipments of 17,168 tons of silver-bearing lime ore. This loss was chiefly attributed to increased cost of mining in open quarries, into which snow drifted and froze, making it difficult and costly to handle the ore. Weather conditions have since improved and shipments are now being regularly made to both the Nelson smelter and the Sullivan Group Mining Co.'s smelter recently completed at Marysville, East Kootenay, on such favorable terms as to promise profitable returns from now on.

Perth. March 1.

Kalgoorlie.—The Great Boulder Proprietary has resumed sinking the main shaft from the 1,900-ft. level, and will open out again at 2,000 ft. Lake View Consols is pushing the deepening of the main shaft, also from the 1,900-ft. level, and intends to carry it down to a much greater depth. The mine continues to open out splendidly at upper points.

The January yield of the Golden Horseshoe was 14,275 fine oz. from 18,112 tons treated. The company has decided to maintain the monthly output of 18,000 tons, worth about £3 10s. per ton. Reserves actually blocked out will enable this output to be maintained for about four years without reckoning further development.

Good discoveries are being made at the 1,000-ft. and other levels of the Ivanhoe. The January output was 16,513 tons for a yield of 10,361 fine oz. Working costs were 19s. 6d. per ton, and the month's profit, £23,801.

In the Kalgurli some rich developments are being made at bottom levels. At the 640-ft., the mass of ore is enormous, and averages over 40 ft. in width. It is proved to run for nearly 400 ft. in payable ore. At the south end the width is 100 ft. At the 900-ft. level the payable ore is over 20 ft. wide.

At the north end of Hannan's Belt the Hidden Secret lease continues to yield rich ore; the latest shipments sent to smelters returned 8.5 oz. gold and 40.5 oz. silver per ton of ore. In the Cross Cut at the 100-ft. level the lode is four ft. wide, while at the 200-ft. level it is nine ft. wide.

The more northern fields are looking very healthy. At Morgan's, the Westralia, Mt. Morgan's mine is pushing on with deep development. Everything to decrease workings costs is being done, and the contract system is now being employed in order to reduce cost of development.

The Sons of Gwalia's January output was 9,688 tons for 5,304 oz. fine gold.

The Golden Pole treated 994 tons for 1,820 ounces.

Sydney. March 6.

The report submitted to the shareholders of the Broken Hill Proprietary Co. for the half year ended November, 1904, is a satisfactory one, and records that gratifying progress has been made in all directions. An increase is shown in the profits and the production of metals, while marked improvements are reported in connection with the treatment of the ore and the turning of the by-products to profitable account. At the meeting the chairman, Harvey Patterson, laid particular stress on the fact that the company was now within measurable distance of producing zinc in such quantity as would represent a good proportion of the world's output. It is recognized that the company is at present largely in the hands of foreign buyers, and it is accordingly proposed to erect reduction works so as to be in an independent position with regard to the disposal of the product. The sale of the zinc concentrate being restricted, the company is necessarily hampered in dealing with its by-products by reason of this limitation. In comparing the annual output from this mine with the world's supply, it is estimated that it produces 8% of the lead and 3% of the silver. Relative to the scheme for the production of spelter now under consideration, the directors of the company estimate that they could supply 5 to 6% of the world's output. At present there are some 2,000,000 tons of tailing in reserve, averaging about 17% of zinc; and as the weekly addition is between 7,000 and 8,000 tons, it is considered that the time has arrived when the treatment of this large quantity of valuable material must be vigorously entered upon. The output of metals from the refinery for the 12 months ended November, 1904, was silver, 5,384,122 oz. fine, and lead, 69,832 tons, the value of same being $6,547,200. In addition, zinc concentrate valued at $108,480 was disposed of, bringing the total value of the output for the year to $6,655,680. The ore raised during this period amounted to 630,000 tons, and the quality of same remains practically unchanged. The developments underground have shown that no concern need be manifested as to the future of the mine for a very long period to come. At the 1,000-ft. level the lode has been proved to a width of 55 ft. without reaching the hanging wall, and in the adjoining mine it has been proved to a depth of over 1,200 ft.

Johannesburg. March 3.

The Chinaman is becoming a financier. He has found a market for his 'pig tail,' $2 being the price given for a first class specimen, so he cuts it off for this sum. When he goes back to China, a wig can be purchahsed for 75c.; thus he makes $1.25 on the bargain. The Celestials continue to spend their money freely. This is the fruit season, and Indian hawkers find a ready market for the fruit they bring to the compounds. Boer farmers in the outside districts find the Chinamen far better customers than the Kaffirs ever were.

There is a certain amount of illicit opium selling going on, but as the mines keep a sharp lookout, the unprincipled traders are frequently caught and severely punished by the law. An ordinance has been passed prohibiting the sale of opium to the coolies, under very heavy penalties. Some people suggested that opium in small quantities be given to the coolies, the trade being placed entirely in the hands of the companies, but the idea is a mistake. In the first place, the coolies from the districts where our Chinamen are recruited are not great opium smokers, many of them knowing it by name only. Should opium be doled out, it would tend to spread the vicious habit. It is far better to treat the opium trade as we treat the liquor trade with Kaffirs—make it well night impossible for the Chinamen to get it. There are some confirmed opium smokers among the coolies, but not many. When they become impossible they are put on the list for re-patriation, and are generally sent back to China.

The annual report of the Chamber of Mines, as usual, affords interesting reading, and, as far as the Chinese workers are concerned, most encouraging. The highest average drilled per man per shift is that of the French Rand mine, with 37 inches. Compared with Kaffir figures, this is highly satisfactory, but it is by no means the limit of what the Chinaman will do with a hammer. As drillers, I think they will in time excel the Kaffir, but in heavy work, such as pushing cars in the mine, they cannot do as well as the stronger black man.

Diamonds are going strong. Syndicates galore are being formed. Base metals are also beginning to raise their heads in the Transvaal, for quite a flutter has been caused by tin in Swaziland, and the fact that the well-known firm of H. Eckstein & Co. is interested in the venture. Whether a base metal can be made to pay under the present economic conditions remains to be seen, but this interest in tin in the South African mining world may be the forerunner of many other enterprises, based upon minerals other than gold, coal and diamonds.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Ben B. Lawrence is in Cuba.

Mr. Rufus M. Bagg, Jr., is at Chihuahua.

Mr. Robert Hay Anderson has returned to Mexico City.

Mr. F. F. Sharpless, of New York, is now in London.

Mr. Henry W. Hill, lately at Bendigo, is now in London.

Mr. M. O. Nelson has returned to London from Sweden.

Mr. R. J. Grant is returning from Western Australia to Denver.

Mr. A. J. Bensusan is on his way from London to Brazil.

Mr. A. C. Beatty has returned from San Francisco to Denver.

Mr. H. W. Ogilbie, of San Francisco, has been in New York.

Mr. John Hays Hammond has returned to New York from California.

Mr. W. S. Edwards, of New York, was recently at Idaho Springs, Colorado.

Mr. Arthur Gifford is appointed superintendent of the Mysore mine, India.

Dr. R. W. Raymond returns from Cananea on or about April 10.

Mr. P. G. Lidner has returned to New York from Guanajuato, Mexico.

Mr. Stephen L. Goodale is with the Camp Bird Co., Ltd., at Ouray, California.

Mr. Charles D. Walcott, of the United States Geological Survey, is at Ottawa.

Mr. Rowland F. Hill has recently returned to New York from New Mexico.

Mr. W. Burrell is superintending mining operations at Laverton, Western Australia.

Mr. J. F. Thomas has been appointed manager of the Ginsberg mine, at Johannesburg.

Mr. Eugene Coste is engaged with examinations in the Leamington oil region, Ontario.

Mr. Louis S. Cates has become manager of the Boston Consolidated mine at Bingham, Utah.

Mr. John A. Dewar arrived on the *Celtic*, and is now with the Tennessee Copper Company.

Mr. T. E. Piercey has been promoted to the position of superintendent of the Champion Reef mine.

Mr. Otto Stalmann, general manager for the Glasgow & Western Exploration Co., is visiting in the East.

Mr. Richard Hancock, superintendent of the Mysore and Champion Reef mines, has retired on account of failing health.

Mr. W. D. Southworth has resigned as superintendent of the Gold Eagle mine, in Nevada.

Captain Duncan McVichie, general manager for the Bingham Consolidated Co., of Utah, was recently at Denver.

Mr. George J. Bancroft has been engaged in examining mining properties in White Pine county, Nevada.

Mr. Carleton R. Downs has resigned as superintendent of the Bunker Hill mine, near Sutter creek, California.

Mr. Fred C. Beedle has resigned as superintendent of the Utica mine at Angeles, California.

Mr. E. W. Walter is general manager for the Green Mountain Mining & Milling Co. in San Juan county, Colorado.

Mr. David H. Lawrence has been appointed consulting engineer to the Germania Gold Mining Co., of Idaho Springs, Colorado.

Mr. Rupert Winters, superintendent for the Boston & Idaho Dredge Co., has returned to Idaho City from a business trip in the East.

Mr. E. J. Collins has been appointed superintendent for the Wolverine & Arizona Mining Co., in Cochise county, Arizona.

Mr. H. C. Lawrence, manager of the Sevier Consolidated Gold Mining Co., of Utah, has been suffering from a severe attack of rheumatism.

Mr. William M. Curtis has been appointed superintendent of the American Flag mine at Park City, Utah, to succeed the late John H. Rhodin.

Mr. L. Cairns, who has been engaged in mining enterprises in South Africa for the past 15 years, will undertake mining operations in Mexico.

Mr. Edward E. Connery, president of the Continental Gold Mining Co., of Vulcan, Colorado, was recently at Minneapolis.

Mr. W. F. Klemp has resigned as president of the Archer Iron Works of Chicago, and is no longer connected with the company in any way.

Mr. J. A. Jamieson is superintendent for the Big Dipper Mining & Milling Co., recently formed to carry on development work in Frontenac.

Mr. Francis A. Govett, a director of the Ivanhoe Gold Corporation, has been inspecting the mines of the corporation in Kalgoorlie, Western Australia.

Mr. L. W. Trumbull is examining the coalfields along the Union Pacific railroad in Wyoming. He will shortly visit the coalfields in the Shoshone reservation, which is to be opened to the public in June, 1906.

Mr. Ed. Hoffman, superintendent of the Silver Shield mine, at Bingham, Utah, has been transferred to the Carisa mine near Silver City, to succeed Mr. George Norman, who retires on account of ill health.

Mr. S. J. Truscott, who is in charge of the Redjang Lebong mine at Lebong Donok, in Sumatra, will be in London about the end of April, for the purpose of buying machinery necessary to enlarge the reduction plant at the mine.

Mr. Thomas J. Hurley, managing director of The Mine Securities Corporation for the past two years, has been elected president of that corporation, succeeding Mr. Theodore E. Leeds, who remains on the board, and has been appointed the general counsel.

Mr. William A. Pomeroy, who was transferred by Messrs. Bewick, Moreing & Co. from the management of the Great Fingall Consolidated, Ltd., Day Dawn, Western Australia, to Kalgoorlie, to succeed Mr. Ralph Nichols as manager of The Great Boulder Perseverance, left Western Australia last October, passed through New York City on his return to his home at Palo Alto, California.

Obituary.

James F. Wardner, a well-known prospector and mining promoter, is dead at El Paso, Texas. Mr. Wardner was connected with many large mining operations in this country and Mexico.

Enos McLaughlin, a pioneer of Colorado, and a leading factor in the development of the Black Hills, died at Spearfish, S. D., March 22, aged 80 years. Mr. McLaughlin was the founder of the town of Maitland, South Dakota.

Isaac L. Requa, former president of the Central Pacific railroad, and at one time superintendent of some of the more prominent mines of the Comstock lode, died recently at San Francisco, aged about 80 years.

Luke W. Bryant, of So. McAlister, Indian Territory, one of the most prominent coal men of the Southwest, died at Kansas City, Mo., on March 26. Mr. Bryant was industrial agent for the Missouri, Kansas & Texas railway; general manager of the Mexican Gulf Coal & Transportation Co., operating coke ovens at Alderson, and mines and coke ovens at Howe, both in the Choctaw Nation. He was also president of the Bryant Coal & Lumber Co., and largely interested in the Degnan-McConnell Coal Co.

Societies and Technical Schools.

Rensselaer Polytechnic Institute.—Two new buildings are about to be erected for this institution at Troy, N. Y. One is for the departments of mathematics and drawing and the other for the department of chemistry. Both will be strictly fireproof. Their cost will be about $300,000.

Dennison University.—The Barney Science Hall of Dennison University at Granville, Ohio, was burned on March 30, entailing a loss of nearly $100,000. The hall was erected by Eugene Barney, of Dayton, 12 years ago, and cost $45,000. The scientific appliances in the hall were worth about $45,000. Some of the most delicate measuring instruments known to science were destroyed. The origin of the fire is unknown.

Massachusetts Institute of Technology.—The articles of agreement under which it is proposed to combine this institution and Harvard University have been made public. They provide for a joint school of industrial science, to be known under the present name of the Institute of Technology, to be governed by an executive board of nine members, of which three shall represent Harvard, and to be maintained by present institute funds, augmented by the income of all funds of the Lawrence Scientific School, by three-fifths of the net income which may accrue from the Gordon McKay bequest, amounting to several millions, and by the income of all property which Harvard may hereafter acquire for the promotion of instruction in industrial science. The new institute is to occupy a site on the Cambridge side of the Charles river, near the present Stadium.

Horace F. Brown, the inventor of the Brown horseshoe furnace, gave a talk to the Mining Engineering Society on March 26. He described the various types of furnaces in use, and traced the development of the modern mechanical roasting furnace. He also spoke upon chlorination and cyaniding. Mr. Brown closed with some practical advice to the men.

Trade Catalogues.

The Wellman-Seaver-Morgan Co., of Cleevland, O., describes in a booklet, just issued, the Dewhurst patent slag ladles and cars.

Comstock lubricators are described in a price-list, issued by the Comstock Engine Co., of New York.

An automatic feed-pump and receiver is described in bulletin B 81, issued by the Geo. F. Blake Manufacturing Co., of New York.

The Star Manufacturing Co., of New Lexington, O., has issued a booklet, describing the mine cars, mine-car wheels and irons, which it manufactures.

Bulletin No. 171, issued by the American Blower Co., of New York, is devoted to a description of the "A B C" vertical engine, type A, with illustrations of their engines and their parts.

A neat little booklet entitled 'Buying Bearings,' is issued by the Ohio Brass Co., of Mansfield, O. It contains information and price-lists concerning the genuine bell-metal motor bearing, which is a product of this company.

The Allis-Chalmers Co., of Milwaukee, Wis., has prepared a handsome catalogue, No. 119, of machinery for cement making, including rock breakers, crushers, dryers, ball mills, tube-mills, etc. The typographical and pictorial work is up to the high standard of this company's productions.

Industrial.

The National Electric Company of Milwaukee, manufacturers of the Christensen Air Brake and Electrical Machinery, is now occupying additional offices in the Old Colony Building, Chicago, and has moved the general sales office of the electrical department from Milwaukee to Chicago.

The H. W. Caldwell & Son Co., of Chicago, is now exclusive selling agent in the United States for the genuine Salem elevator buckets, manufactured by the W. J. Clark Co., of Salem, Ohio.

The S. H. Supply Co., of Denver, is filling the following orders for machinery: A complete air-compressor plant, consisting of a 4-drill compressor with the necessary boiler capacity, air receivers, drills, etc., to Colorado; a hoisting plant, including 6 x 8 double friction hoist, boiler, buckets, and cable, to the Saddle Mountain Mining & Milling Co., of Arizona, and a 10-stamp mill with copper plates and power plant to California.

The Mammoth Copper Mining Co., of Salt Lake City, has just placed an order with the Westinghouse Electric & Manufacturing Co. for a large addition to its electrical equipment. A total of nearly 800 h.p. in induction motors of different sizes together with a motor-generator set, transformers, switchboard and three mining locomotives, is included in the order. The motors, two of which have a rated capacity of 200 h.p. each, and five of 50 h.p. each, will operate on three-phase, 2,000 volt circuits. Electrical machinery is used very extensively in mining operations, and this order is indicative of the progress being made in this field.

The Cia Minera Las Dos Estrellas has ordered from the Allis-Chalmers Co., to be set up at El Oro, Estado de Mexico, Mexico, one 120-stamp (1,250 lb.) gold mill, complete with cyanide plant equipment and apparatus, for operating all of its machinery by electric power. The electric equip-

ment will include 13 alternating current motors ranging in size from 10 to 100 h.p. A Reynolds-Corliss engine, with cylinder 32 in. in diameter and a 42-in. stroke, was recently shipped to this company from the West Allis, Milwaukee, works of the Allis-Chalmers Co., which has furnished practically the entire outfit heretofore used at the plant above mentioned. The mining machinery will be made at its Chicago works.

Two 800-h.p. Doble main unit wheels and two 40-h.p. Doble exciter wheels have been built for the new Santa Ana No. 2 plant of the Edison Electric Co., of Los Angeles. These wheels will operate under a head of 305 ft., the speed of the 800-h.p. wheels being 176 r. p. m. Two 75-h.p. Doble exciter wheels have been built for the Pike's Peak Hydro-Electric Co., of Colorado, to operate at a speed of 975 r. p. m., under a head of 2,100 ft., the highest in the United States. A 300-h.p. Doble wheel equipped with two Doble needle regulating nozzles has been ordered by the Hilo Electric Light Co., of Hawaii. For the Nevada City plant of the California Gas & Electric Corporation, three 570-h.p. Doble wheels have been supplied to operate under a head of 190 ft. The California Fish Commission ordered a Doble wheel to work under the low head of 23 ft. The Braden Copper Co., of Chile, has ordered four 340-h.p. Doble wheels for operation under 930 ft. head, three for belt drive and one for direct connection to any electric generator. Doble 12-in. laboratory water motors have been built for the University of Illinois and the University of Texas. An interesting order recently received calls for a complete sawmill outfit to be installed in the Philippine Islands, the machinery to consist of a Doble motor wheel operating under 400 ft. head and directly connected to the mill. The order included the sawmill as well as the riveted steel pipe for the pipe line.

General Mining News.

ARIZONA.

MOHAVE COUNTY.

Gold Road.—This mine, in San Francisco district, has uncovered a new character of ore on the 500-ft. level, richer than that found in the workings above.

Ben Harrison.—This mine, in Snowball district, is drifting on a good-sized vein of shipping ore on the 375-ft. level. Further sinking on the shaft will be discontinued until this is followed up.

Galt.—This mine, in Leland district, near the Colorado river, is in a new and small vein of gold quartz at a depth of 80 ft. The gold is in soft lime, and is visible to the eye.

Ben Loman.—This new gold location, near Sheeptrail, is in a new vein of ore, showing free gold of a shipping value.

Minnesota.—A company has taken over this mine at Chloride for a working option, and three shifts of men are driving in the old tunnel on the 600-ft. level toward the summit of the range. In addition to this development work, the present owners will run the old ore dump, consisting of thousands of tons, through the 250-ton concentrator at the mine.

Bearfoot.—This mine, eight miles northwest of White Hills, will ship 100 sacks of gold ore, consisting of over five tons, at the end of the month.

PINAL COUNTY.

Quijotoa.—This mine, 90 miles south of Tucson, will be operated by a new California company under a lease and bond of $50,000 from the present owners. They will establish a new process of reduction for the ores, and develop and work the shaft and drifts with a considerable force of men.

Bluejacket.—This mine, south of Tucson, has caught up with the last orebody in drifitng on the 450-ft. level. The new orebody is of good size, and is rich in gold and copper as formerly.

Wolfram.—This mine, near the old Maricopa Wells, which developed a good grade of wolframite ore recently, will make a shipment to San Francisco next week. Most of the developments are being done in drifting at a depth of 50 ft. The owners are doing the work.

YAVAPAI COUNTY.

Yellow Leaf.—Mexicans are taking out good ore from this mine on Yellow Creek. Drifting on the 50-ft. level was impeded during the late rains, and a shaft is being sunk on the ore dike further up the mountain to obviate further stoppage.

Goldrun.—This mine, near the Hassayampa river, 18 miles northeast of Prescott, is down 130 ft., with ore of a passable value in evidence. At a depth of 150 ft. drifting will be done to open larger ore.

CALIFORNIA.

AMADOR COUNTY.

Climax.—A 10-stamp mill is to replace the two-stamp mill at this mine, where about 25 men will be set at work.

Zeila Mining Co.—At this property, Jackson, two new levels are being opened, one at 1,450 and the other at 1,550 feet.

Central Eureka Mining Co.—The ore from this mine is milling regularly from $6 to $8 per ton, and about 5,000 tons a month are being crushed. A 10 years' contract has been let for electrical power to run the 40-stamp mill and rock breaker, and the hoist will soon be operated by the same power.

Fremont Consolidated Mining Co.—At this mine, Drytown, Arthur Goodall, manager, 100 men are now employed. Extensive prospecting is being done in both the Gover and Fremont mines. The mill is being run to its full capacity.

Wildman-Mahoney. — The connecting drift from the Lincoln shaft to the Mahoney is now in 650 feet. The ore shoot at the 1,400 level of the Wildman is large and of satisfactory value.

CALAVERAS COUNTY.

Benson.—A rich vein has been uncovered on the 100-ft. level of this mine at Angels.

Port Arthur.—At this mine near Altaville, Lewis Lane superintendent, the hoisting machinery is now all in place and shaft sinking has commenced.

Union Copper Co.—This company has 150 men at work erecting a large smelter and a steel hoist. The mine is being cleaned out and retimbered.

BUTTE COUNTY.

Golden West Tunnel & Mining Co.—This company at Mooretown, J. H. Flynn superintendent, is about to resume active operations.

EL DORADO COUNTY.

Hanson.—This company at Georgetown is about to be re-opened by a local company, and a two-stamp mill is being put up.

American River Consolidated Mining Co.—This company has been organized by those who have taken up claims along the American river. It controls about 9,000 ft. of the river bed. The power company removes nearly all the water from the river during the dry season, leaving the bed bare and in good shape for mining.

CALAVERAS COUNTY.

Ginochio.—D. P. Gray, of Oakland, who holds a bond on the mine on the lower Calaveritas, will shortly begin the work of opening the property.

San Andreas.—Work is to be resumed on this quartz mine at San Andreas, and the shaft sunk deeper.

Preston & Donovan.—Work on this mine near San Andreas has been commenced by the Oakland men holding the bond.

INYO COUNTY.

Two men have brought in $1,000 in coarse gold derived from dry washing operations in two months at Santa Rita, Mazourka district. It is practicable to pipe a head of water to any part of the district, which is six miles long and two miles wide, but capital is necessary to accomplish this. The ground is known to be rich.

KERN COUNTY.

Yellow Aster Mining Co.—This company at Randsburg is about enlarging its water supply in order not only to increase the capacity of the mill, but also to put in a cyanide plant.

Little Butte.—This company at Randsburg has obtained a release of its property from the bond held by the Consolidated Mines Co. The indebtedness is to be paid off and enough funds obtained by an assessment to open up a part of the company's property.

MADERA COUNTY.

Markle.—All the machinery for this mine at O'Neals has been purchased and some of it has arrived and is being put in place. Three shifts of underground men will now be set at work.

Carder.—This is a new mine at O'Neals, but already some rich ore has been uncovered. It is an extension of the Ryan, Sym & Ragesdale claim.

NAPA COUNTY.

Philadelphia Quicksilver Mining Co.—This company has been organized by N. H. Lang, J. B. Cronan, O. A. Roleau, Edwin Lang, and Martin Pluth to operate a quicksilver mine in Pope valley, south of the Corona and Oat Hill mine, and north of the Etna. A 500-ft. tunnel is to be run into the mountain to develop the orebody.

NEVADA COUNTY.

North Star Mines Co.—A very rich strike is reported in the Central shaft workings of this mine at Grass Valley, A. D. Foote, superintendent. The 'bunch' was as rich as any which has been found in the mine.

Bullion.—A very heavy flow of water has been encountered in this mine at Grass Valley, George Mainhart, superintendent, larger pumps will have to be put in, as the water has reached the 1,100-ft. level.

RIVERSIDE COUNTY.

Buckeye Mining & Milling Co.—Harmon Bros. have sold their 20 claims in Tauquitz district, near San Jacinto, to this company. A cross-cut tunnel has tapped several of the ledges.

SANTA BARBARA COUNTY.

Brookshire.—This gushing oil well in Santa Maria district is yielding from 6,000 to 7,000 bbl. per day.

SAN LUIS OBISPO COUNTY.

Pine Mountain Consolidated.—These quicksilver mines at San Simeon, owned by the American Exploration & Development Co., are about to be disposed of to

Eastern men, who will inaugurate active development work in a number of partially developed claims.

TUOLUMNE COUNTY.

Omega.—At this mine a steam hoist has been built and machine drills put in use.

Jumper Gold Syndicate.—At this property, Stent, Superintendent M. D. Kelly has put 20 stamps at work.

Santa Ysabel.—The shaft has reached 800 ft., and cross-cutting and drifting are being done. Twenty stamps of the mill are ready for operation.

COLORADO.

GILPIN COUNTY.

March Shipments.—During the past month the shipments of smelting and crude ores, tailing and concentrate from the Black Hawk depot to the Denver and Golden smelters and to outside points of treatment were 359 cars, or 7,525 tons. This record beats any month's shipments for several years by nearly 25 per cent.

Pearce Gold Mining Co.—This company, incorporated with $50,000 capital stock, has lease and bond on the Sutton group, Russell district, and will install machinery. Frank Hardy, Central City, is superintendent.

Denver & Northwestern.—This property has been sold by Bramlett Bros. to A. G. Rummell, of Denver, for $5,000. The property is in Wisconsin district on the line of the new Moffat road, and a contract for 500 ft. of tunnel work has been let, and machinery may be installed. W. L. Shull, Denver, is manager.

Delmonico.—Louisville, Ky., parties are interested and are making arrangements to resume operations after a shutdown of several months. The main shaft is down 1,300 ft., the property is equipped with its own mill and the mill will soon be started up. E. Steffan, Central City, is superintendent, and employment will be furnished to a large working force.

Gauntlet Mining Co.—Iowa parties are interested and will install a larger boiler on their Gauntlet mine, intending increased operations. L. D. Hobson, Central City, is manager.

Pozo.—During the past month three cars of zinc concentrate have been shipped to the Colorado Zinc Co., at Denver. This mine is in Nevada gulch. A. M. Rucker, Bald Mountain, is manager.

Russell Gulch Mining & Development Co.—This company will resume operations on the Rocky Mountain Terror group in Russell district, intending sinking after dead work is completed. George K. Kimbal, Jr., of Idaho Springs, has been appointed manager.

Pine Creek District.—A contract to sink 200 ft. on the Snowdon has been let by Manager W. C. Hollister, of Apex, and as soon as snow is off regular shipments will follow.

West Nottaway.—Pool & Co. are operating under lease, and are shipping several cars per week to smelters, carrying very uniform values. They have also taken hold of the Alva Adams, adjoining property, and are commencing to take out smelting ores.

Town Topics Gold Mining Co.—Shipments from the 555-ft. levels by lessees netted $155 and $110 per ton, and a large amount of fair grade milling ores is being shipped by lessees, by which method the company has paid over $50,000 during the past three years. S. A. Josephi, Barth block, Denver, is manager, and Tom Martin, Central City, is superintendent.

Whistler.—Sternberger Bros., of Denver, have started work on this claim in Russell district, and will install machinery and sink several hundred feet, as they report a good vein of iron in shaft. Fred Woods, Russell Gulch, is superintendent.

Gower Mines Syndicate, Ltd.—A four-drill Rand compressor has been delivered at the Running Lode mine, near Black Hawk, and preparations are under way for sinking the shaft. The company is a close British corporation, and paid 140 per cent on its capital stock in 1904. T. Dunstone, Black Hawk, is superintendent.

Homestake Gold Mines Co.—Articles of incorporation show capital stock of $300,000, with local and Denver parties interested. The company has taken a lease and bond on the Homestake mine in Lake and Russell districts, situated near the well-known Pittsburg and East Nottaway mines. Will sink 200 ft. and do liberal developments, and will require heavier machinery in early future. B. G. Granville, Central City, is manager.

Cashier Gold Mining & Reduction Co.—A shipment by Rowett & Jordan from the 400 east level of the Pittsburg mine brought values of 14.10 oz. gold, 12 oz. silver and 7.72 per cent copper, or a net value of $296 per ton. Company is a regular dividend payer, B. L. Campbell, Central City, being superintendent.

PARK COUNTY.

Copper Verde.—G. W. Chance & Co., of Philadelphia, have purchased this copper-gold property. It is in the great dike running along Badger mountain and nine miles from Lake George, on the Colorado Midland. The property is easily worked, and the ores free milling. Iron is characteristic of the ores of this belt. It is close to the Wisconsin, Maverick and Golden Gate mines. It is probable a company will be formed to work this property.

SAN JUAN COUNTY.

Green Mountain Mining & Milling Co.—This company's property is on Cunningham gulch. A vein, ranging in width from 5 to 13 ft., strikes north-south through an andesitic breccia. A cross-cut intersects the vein about 300 ft. below the surface, and a drift thereon has been driven 500 ft. on ore, showing iron-copper-lead sulphide ore in a quartz gangue, carrying gold, silver, lead and copper in paying quantity. A concentrating plant is being erected on the property, the equipment to be crushers, rolls, jigs, chilean grinders, tables and centerpact screens, all to be operated by steam power. An aerial tramway, three-quarters of a mile in length, will be erected to convey the ore from the mine to the mill. Equipment for the mill and mine are being furnished by the Colorado Iron Works, of Denver. The mill's capacity will be about 300 tons of ore per day. E. W. Walter, of Silverton, is general manager of the Green Mountain Co., with D. Umbell as mine superintendent. A branch from the Silverton-Eureka railroad will be built from Howardville up Cunningham gulch to afford transportation facilities for this and other mines in this locality.

Old Hundred.—Howell Hinds has a bond and lease on this property, in Cunningham gulch. It is being developed and equipped under the superintendency of R. W. Davis, Jr. A power plant has been installed and an aerial tramway has been erected in three sections, which extends from the bottom of the gulch up the mountain side to the various adit levels. The building of a mill is a probability at a later date.

TELLER COUNTY—CRIPPLE CREEK.

Eagle Ore Co.—A consolidation has been effected of the business of the Eagle Sampling Co. and the Rio Grande Sampling Co. The new company will be known as the Eagle Ore Co. The plant of the Rio Grande Sampling Co. will be abandoned, and all the business done at the Eagle plant on Battle mountain. Nelson Franklin, manager of the old Eagle company, will be manager of the new concern.

Forest Queen.—A new boiler is being placed on this property, which is being worked under lease by Mr. Walsh and associates. A considerable amount of ore is being shipped from this property, which adjoins the famous W. P. H. mine on Ironclad hill. The shaft is at present 600 ft. deep, and it is understood that it is soon to be sunk deeper.

Homestake.—The new mill on this property on Ironclad is now nearly ready to run continuously. Some ore has already been treated by the mill, but is not yet quite in running shape. The mill is one of the largest cyanide mills in the country, it being designed to treat 1,000 tons per day. The mill is to treat a large body of low-grade oxidized ore. The handling of the ore is entirely automatic, and the vats consist of 6 steel tanks of 1,000 tons each. The ore is mined on a large scale, the whole hill being mined. The result of the operation on this property is being watched with interest.

Empire State Mines Co.—The new machinery is being put in place on this property. It is the intention of the company to do a large amount of development work, and great results are looked for. A large amount of ore has been taken out of this property in the past.

Pharmacist Consolidated Mining Co.—It is understood that a lease has been granted on this property to H. M. Gilbert, and that a large amount of development work is being contemplated, both drifting and sinking. A number of smaller lessees are also at work on the property.

Stratton Estate.—Another of the larger workings of the property belonging to this estate. The John A. Logan has been leased to Judge Luther M. Goddard, of Denver; Hon. Irving Howbert, of Colorado Springs and others. The lease is understood to run for two years. It is stated that the balance of the Bull hill property will also soon be leased.

ILLINOIS.

FRANKLIN COUNTY.

Leiter.—Nearly half a hundred miners were entombed on April 3 in Joseph Leiter's mine at Zeigler by an explosion of gas, and it is probable that most of the buried men are dead. There were two explosions close together. The first explosion took place in the air shaft, and was followed by a much greater upheaval in the main shaft. The explosion wrecked the shaft, blowing out the skids on which the cages were hoisted. Besides 15 bodies recovered, three men were removed alive, but with probably fatal injuries. An all-day investigation tends to show that the catastrophe was due to the accidental explosion of accumulated gas.

INDIANA.

The strike in the Jackson Hill mines, which threatened to extend to other mines in Sullivan county, has ended. The three men whose discharge nearly caused a general suspension of mining in Indiana have been reinstated. The matter of settlement was left with President Boyle, of the Min-

ers' Association, and Superintendent Evans, of the mine, and they soon agreed on the matter. The men were ordered back to work, and the discharged men reinstated. The operators gained the point that no grievance shall be considered while the men are on a strike. Both sides saw imminence of a general strike and were willing to settle if each could claim a point gained. A joint meeting of the executive boards will be held soon to construe the clause about loading 'dirty' coal, the strike resulting from the discharge of men for loading this coal. An order to the operators to suspend the check-off at all mines in the State has been recalled and there is no trouble anywhere in the State except at the Triber coal mine near Carbondale, where the mine has been worked back under a graveyard. The miners are refusing to work because of alleged sepulchral tones or voices which have startled the miners and occasioning them to scamper for the surface. An investigation has been ordered, and the frightened men will likely return to work soon.

Fire-damp caused an explosion in the Oswald shaft of the Princeton Coal Mining Co., in Gibson county, on March 22, killing six men and injuring five others. The cause of the disaster is thought to have been a powder explosion, which filled the mine with deadly gas. The explosion occurred at 4 o'clock, just as the miners were preparing to leave the pit, a majority having reached the surface. The rescuers worked at a disadvantage, the mine being full of fire-damp. They also found the supports of the mine gone and the slate roof fallen in at several places, but by hard work the mangled dead were brought to the surface. The disaster caused great excitement, being the second accident of the kind in this mine. Twelve lives were lost by an explosion in 1896. Those who have investigated the mine entertain the belief that the explosion was due to the carelessness and recklessness of the miner who was doing the blasting. The superintendent of the mine said that he had continually warned the miners to obey the law in regard to blasting, but that it had been continually violated. The law prohibits a miner from drilling more than a foot beyond the edge of where he has cut, and he is not allowed to use more than eight pounds of powder in his drill . It is difficult to get the miners to obey this restriction, as they believe they can blow down more coal without disastrous results. James Eperson, State mine inspector, has not yet made his report concerning the cause of the explosion.

In furtherance of the great coal combine the Deering Coal Co., of Chicago, has purchased the Willow Grove mine in the Clinton field, and the Paisley mine in Vermillion county, making 15 Indiana mines for the company, with options on quite a number of others. It is said that two similar companies are promoting deals for Indiana mines, and, as in the case of the Deering company, men who can control the orders for coal by great industries are to have a large share of stock or bonds of the merger companies.

A second coal company has been organized in Warren county, under the name of the Dinsmore Coal Mining Co., with headquarters in Williamsport. A shaft will be sunk in Liberty township, and as the steam pumps, boilers, engines and hoisting machinery have been received, it is expected the mine will be in operation by April 15.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Baltic.—Arrangements for the erection of a permanent steel shaft and rock house at No. 2 shaft have been completed. A contract has been awarded to the Wisconsin Bridge & Iron Co., of Milwaukee, Wis. The structure will be of the usual type in this district, only will have larger rock bins. There are four permanent shafts, No. 2, 3, 4 and 5. The three latter are equipped with steel shaft rock houses, but permanent hoisting engines are installed only at No. 3 and 4. At No. 2 the erection of an engine house has been completed. A double conical drum Nordberg hoisting engine is on the ground, and will be installed as soon as possible.

Calumet & Hecla.—Work on the Osceola amygdaloid branch is confined to No. 13 shaft, the southernmost shaft, where 20 drills are in service. This shaft is nearly 1,500 ft. deep and penetrates a good stretch of cupriferous ground. No sinking is being done, but drifting is under way both north and south from the second to eleventh levels, inclusive. These drifts are being carried forward as drift stopes, which permits the extraction of rock economically and tests the ground as it is opened in a thorough manner. Rock shipments feed one head, and the refined copper average is understood to be one per cent. One compartment of the shaft is already in commission, and the temporary hoist is used. There is a large capacity engine housed in a commodious redstone building, which is designed for permanent use, but it has never been placed in commission.

Centennial.—Development work is being pushed with all possible speed. No. 1 shaft is sinking below the 25th level at an approximate depth of 2,800 ft. The character of the ground coming into the bottom of the shaft is good, and additional depth should bring it into the rich shoot of copper rock, making southward from the Wolverine. The work of opening No. 2 is being prosecuted vigorously, and the next six months should witness its completion to the deeper levels as a full-sized two-compartment shaft. This will overcome the problem of ventilation, which has proved very vexatious at times, permitting better and more rapid work on the part of the miners, who have been subjected to discomfort from foul air in some of the workings. The recent assessment brings in $360,000, which it is figured will suffice for one year's development work at the present rate. This is on the basis of $1,000 per month for each of the 25 drills in use, and $5,000 per month for incidental expenses.

PENNSYLVANIA.

BITUMINOUS COAL.

Kennedy Coal & Coke Co.—This company has purchased 3,500 acres of coal lands in Conemaugh and Jenner townships, Somerset county, at a stated price of $100 per acre.

Meyersdale Coal Co.—This company has purchased 1,650 acres of coal lands near Tistil, Somerset county. It will work this in connection with its mines at Listic. The reported price is $100 an acre.

Jones & Laughlin Co.—This company is reported to have purchased 9,600 acres of coal land on the Monongahela river, near Brownsville, for $3,000,000.

UTAH.

BEAVER COUNTY.

Black Rock.—Some good ore has been encountered in this property, and indications are that it will soon be a shipper.

Copper Mountain.—Ore bins are being built at this property. The lower workings show some good grade copper ore.

Beaver Lake Copper.—Work is soon to be resumed at this mine. A. J. McMullen, Salt Lake City, is manager.

JUAB COUNTY.

Grand Central.—Connections will soon be made with the orebodies on the 1,300-level, which will insure a greater output.

Centennial-Eureka.—This mine is sending to the United States smelter at Bingham Junction approximately 600 tons of ore daily.

WASHINGTON.

FERRY COUNTY.

A suitable milling process for the treatment of Republic ores is needed. Either roasting or concentrating on Frue vanning tables will probably be required before cyaniding. Any competent metallurgist who can demonstrate his ability to successfully mill Republic ores at a low cost, or devise a method for treating them cheaply in unlimited quantities, can win profit. D. C. Jackling, who formerly had charge of the Republic Power & Cyaniding Co.'s mill and planned and supervised its construction, came nearer succeeding than any other person.

Republic & Kettle River Railway Co.—This company has changed its name to the Spokane & British Columbia Railway Co., and increased its capital stock from $1,000,000 to $5,000,000. At a recent meeting W. T. Beck was elected president and J. E. McFarland secretary, each of them residing at Republic.

Quilp.—This mine is again closed down, owing to the want of a market for the ore and the excessive charges for treatment at the smelters.

Ben Hur.—The mine has been unwatered. Guides are being placed in the shaft, getting ready to hang the cage.

Keller & Indiana Smelting Co.—A part of the machinery is in transit for a 100-ton copper-matteing and a 50-ton lead-smelting furnace for installment at Keller, on the Sans Poil river, about 50 miles south of Republic.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA-BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending March 25 were as follows, in tons: Granby, 13,650; Mother Lode, 3,456; Brooklyn, 2,341; Rawhide, 2,002; Mountain Rose, 201; Emma, 266; Oro Denoro, 100; Skylark, 45; total for week, 22,061 tons; total for year to date, 203,108 tons.

BRITISH COLUMBIA-ROSSLAND DISTRICT.

Rossland Ore Shipments.—Shipments for the week ending March 25 were as follows, in tons: Le Roi, 2,850; Centre Star, 2,040; War Eagle, 1,260; Le Roi No. 2, 30; Spitzee, 120; White Bear, 75; White Bear, milled, 600; Jumbo, 50; total for week, 7,025 tons, and for year, 81,701 tons.

DIVIDENDS.

Gold, Silver, Lead, Quicksilver and Zinc Companies—U. S.

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val $	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	Al'ka.	$1,000,000	180,000	5	$996,381	Mar. 1905	$1.00
Alaska Treadwell, g.	Al'ka.	5,000,000	200,000	25	6,300,000	Feb. 1905	1.50
Amalgamated, c...	Mont.	155,000,000	1,530,879	100	27,343,000	Feb. 1905	1.00
Am.Sm.&Ref.,com..	U. S.	50,000,000	500,000	100	3,750,000	Apr. 1905	1.25
Am. Sm. & Ref. pf..	U. S.	50,000,000	500,000	100	17,641,553	Apr. 1905	1.75
Anaconda, c.....	Mont.	30,000,000	1,200,000	25	24,450,000	Nov. 1904	.50
Annie Laurie, g....	Utah.	5,000,000	25,000	100	427,561	Mar. 1905	.50
Arizona, c.....	Ariz..	3,775,000	.....	...	6,180,728	Feb. 1905	.....
Atlantic, c.....	Mich.	2,500,000	100,000	25	990,000	Feb. 1905	.50
B. & H., l. z.....	Mo...	400,000	400,000	1	20,000	Feb. 1905	.01
Boston & Mont	Mont.	3,750,000	150,000	25	40,025,000	Jan. 1905	10.00
Bunker Hill & Sull..	Ida...	3,000,000	300,000	10	2,571,000	Mar. 1905	.50
Butte & Boston, c..	Mont.	2,500,000	200,000	25	1,800,000	Feb. 1904	1.00
Calumet & Arizona c	Ariz..	2,500,000	200,000	10	2,100,000	Mar. 1905	2.00
Calumet & Hecla, c.	Mich..	2,500,000	100,000	25	88,850,000	Mar. 1905	15.00
Camp Bird, g.....	Colo..	5,500,000	820,000	5	1,902,504	Feb. 1905	.18
Center Creek, l. z...	Mo...	1,000,000	10,000	10	170,000	Oct. 1904	.10
Central Eureka, g..	Cal...	4,000,000	400,000	10	559,159	Apr. 1905	.07
Central, l.....	Mo...	1,000,000	10,000	100	450,000	Mar. 1905	.10
Century, g.s.l.	Utah.	150,000	150,000	1	30,000	July 1904	.02
C. K. & N., g.....	Colo..	1,500,000	1,431,900	1	229,104	Dec. 1904	.01
Con. Mercur, g.....	Utah.	5,000,000	1,000,000	5	1,030,000	May 1903	.03
Continental, z.....	Mo...	550,000	22,000	25	99,000	Jan. 1905	.50
Copper Range Con .	Mich.	38,500,000	383,781	100	383,781	Apr. 1905	1.00
Creede United, g ...	Colo..	500,000	500,000	1	120,000	Dec. 1904	.03
Daly West, g.s.l ...	Utah.	3,600,000	180,000	20	4,643,000	Mar. 1905	.60
De Lamar, g.s.	Ida...	400,000	67,180	5	2,796,770	Oct. 1904	.48
Doe Run, l.....	Mo...	1,500,000	15,000	100	729,572	Jan. 1905	1.50
Elkton Con., g.....	Colo..	3,000,000	2,500,000	1	1,466,961	Mar. 1905	.00½
El Paso, g.....	Colo..	2,500,000	2,500,000	1	373,550	Jan. 1905	.02
Fed. Sm., com.....	Idaho.	10,000,000	50,000	100	353,750	Mar. 1905	2.50
Federal Sm., pf. ...	Idaho.	20,000,000	100,000	100	1,076,250	Mar. 1905	1.75
Findley, g.....	Colo..	1,250,000	1,250,000	1	25,000	Apr. 1905	.01
Gemini-Keystone ..	Utah.	500,000	5,000	100	1,250,000	Mar. 1905	10.00
Gold King.....	Colo..	1,000,000	936,850	1	491,847	Feb. 1905	.01
Gold Sovereign	Colo..	2,000,000	2,000,000	1	10,000	Jan. 1905	.00½
Grand Central, g...	Utah.	250,000	250,000	1	993,750	Dec. 1904	.05
Hecla, s.l.....	Idaho.	250,000	1,000,000	25	250,000	Mar. 1905	.01
Hercules-Horsh'e, g.	Cal...	1,000,000	340,000	1	2,250	June 1904	.00½
Homestake, g.....	S. D..	21,840,000	218,400	100	3,241,350	Mar. 1905	.50
Horn Silver,g.s.c.z.l.	Utah.	10,000,000	400,000	25	5,462,000	Mar. 1905	.05
Iowa, g.s.l.....	Colo..	1,666,667	1,666,667	1	186,833	July 1901	.01
Iron Silver.....	Colo..	10,000,000	500,000	20	3,200,000	Mar. 1905	.10
Jamison, g.....	Cal...	3,900,000	390,000	10	178,700	Jan. 1905	.03
Kendall, g.....	Mont.	2,500,000	500,000	5	780,000	Mar. 1905	.05
Liberty Bell, g.....	Colo..	700,000	130,349	1	169,441	Oct. 1904	.15
Lightner, g.....	Cal...	125,000	102,255	1	270,132	Mar. 1905	.05
Lucky Budge, z....	Mo...	40,000	400	100	42,000	Dec. 1904	10.00
Lyon, z.l.....	Mo...	50,000	4,585	10	2,117	Jan. 1905	.20
Mammoth, g.s.l. ...	Utah.	10,000,000	400,000	25	1,980,000	Nov. 1904	.05
Mary McKinney, g..	Colo..	1,000,000	1,000,000	1	650,000	Oct. 1904	.03
Mines Co. of Am. ..	U. S..	2,000,000	2,000,000	1	915,000	Mar. 1905	.01½
Mont. Ore Purch...	Mont.	2,500,000	81,000	25	3,780,000	Nov. 1904	2.00
Monument, g.....	Colo..	300,000	300,000	1	27,124	Apr. 1905	.01
Nat'l Lead, pf.....	U. S..	15,000,000	149,040	100	13,823,460	Mar. 1905	1.75
Nevada Keystone,g.	Nev..	1,000,000	638,877	1	61,790	Feb. 1904	.03
New Century, z....	Mo...	150,000	150,000	1	16,500	Apr. 1905	.01
New Idria, q.....	Cal...	500,000	100,000	5	730,000	Apr. 1905	.30
New Jersey, z.....	U. S..	10,000,000	100,000	100	7,500,000	Feb. 1905	3.00
North Star, g.....	Cal...	2,500,000	250,000	10	856,356	Dec. 1904	.35
Northern Light, g.s.	Utah.	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Gold.....	Colo..	2,101,150	2,101,150	1	10,506	Mar. 1904	.05
Ophir, g.s.....	Nev..	302,400	100,800	3	1,797,400	July 1904	.25
Osceola, c.....	Mich..	2,500,000	96,150	25	4,631,900	Jan. 1905	2.00
Oustomah, g.....	Cal...	250,000	250,000	1	12,500	Mar. 1904	.05
Parrot, c.s.....	Mont.	2,300,000	229,850	10	6,117,710	Mar. 1905	.50
Pennsylvania, g....	Cal...	5,150,000	51,500	100	264,325	Mar. 1905	.10
Portland, g.....	Colo..	3,000,000	3,000,000	1	5,557,080	Jan. 1905	.06
Quicksilver, pf.....	Cal...	4,500,000	43,000	100	1,931,411	May 1903	.50
Quilp, g.....	Wash.	1,500,000	1,500,000	1	15,000	Apr. 1904	.01
Quincy, c.....	Mich..	2,500,000	100,000	25	14,920,000	Feb. 1905	3.00
Red Bird g.s.c.l....	Mont.	1,500,000	300,000	5	72,000	Dec. 1904	.01
Rob Roy, z.....	Mo...	15,000	14,325	1	3,375	Dec. 1904	.03
Rocco Homest'k, l.s.	Nev..	300,000	300,000	1	94,000	Jan. 1904	.01
Sacramento, g.....	Utah.	5,000,000	1,000,000	5	213,000	Aug. 1904	.00½
Salvator, g.s.l.....	Utah.	200,000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l.....	Mo...	6,000,000	375,000	10	4,059,500	Dec. 1904	.15
Silver Hill, g. s	Nev..	180,000	180,000	1	46,800	Mar. 1904	.05
Silver King, g.s.l...	Utah.	3,000,000	150,000	20	8,950,000	Mar. 1905	.66⅔
South Swansea, g.s..	Utah.	300,000	300,000	1	170,500	Apr. 1904	.01
Spearfish, g.....	S. D..	1,500,000	1,500,000	1	165,500	Jan. 1905	.01½
Standard Con., g.s..	Cal...	2,000,000	178,394	10	4,160,331	Sept.1903	.10
Stratton's Independ.	Colo..	5,500,000	1,000,007	5	4,380,862	Feb. 1905	.12½
Tamarack, c.....	Mich..	1,500,000	60,000	25	8,580,000	Jan. 1904	1.50
Tennessee, c.....	Tenn.	5,000,000	175,000	25	437,500	Jan. 1904	1.25
Tomboy, g.s.....	Colo..	1,500,000	300,000	5	1,316,000	Dec. 1904	.24
Uncle Sam.....	Utah.	200,000	200,000	1	65,000	Dec. 1904	.02½
United, c., pf.....	Mont.	5,000,000	50,000	100	750,000	Nov. 1904	3.00
United, z.l., com...	Mo...	5,000,000	92,400	5	27,490	Oct. 1903	.05
United, z.l., pf.....	Mo...	1,000,000	19,556	25	172,647	Jan. 1905	.75
United (Crip'le C'k)	Colo..	5,000,000	4,009,100	1	280,071	Apr. 1905	.00½
United Verde, c....	Ariz..	3,000,000	300,000	10	17,085,322	Dec. 1904	.75
United States, g.s.c.	Utah.	21,500,000	480,000	25	420,000	Feb. 1905	.50
Utah, g.....	Utah.	1,000,000	100,000	10	225,000	June 1904	.01
Utah Con., c.....	Utah.	1,500,000	300,000	5	3,036,000	Jan. 1905	1.50
Vindicator Con., g..	Colo..	1,500,000	1,100,000	1	1,225,000	Jan. 1905	.03
Wash No. 2, g.	S. D..	500,000	147,900	1	234,679	June 1904	.03
Wolverine, c.....	Mich..	1,500,000	60,000	25	2,070,000	Apr. 1905	5.00
Work, g.....	Colo..	1,500,000	1,500,000	1	7,500	Feb. 1905	.00½
Yellow Aster, g....	Cal...	1,000,000	100,000	10	583,789	Feb. 1904	.15

Coal, Iron and Other Industrials—United States.

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val $	Dividends. Date.	Latest Date.	Amt.
Ala. Con., C.&I., pf.	Ala...	$2,500,000	$24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf..	U. S..	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Alma Oil.....	Cal...	400 000	400,000	1	57,600	Nov. 1904	.03
Amer.Ag.Chem., pf..	U. S..	20,000,000	181,350	100	6,286,790	Apr. 1905	3.00
American Cement..	Pa....	2,000,000	200,000	10	760,000	Jan. 1905	.30
American Coal.....	Md...	1,500,000	50,000	25	1,620,000	Mar. 1905	1.25
Associated Oil.	Cal...	21,000,000	21,000,000	1	315,000	Feb. 1905	.01½
Bon Air C. & I., pf..	Tenn..	2,500,000	18,803	100	249,757	Oct. 1904	1.50
Cambria Steel	Pa....	50,000,000	900,000	50	8,475,000	Feb. 1905	.75
Caribou Oil	Cal...	100,000	80,000	1	33,600	Mar. 1905	.07
Central C. & C., com.	Mo....	5,125,000	51,250	100	1,012,500	Apr. 1905	1.50
Central C. & C., pf..	Mo....	1,875,000	18,750	100	937,496	Apr. 1905	1.25
Central Oil.....	W.Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil	Cal...	500,000	450,000	1	49,500	Apr. 1905	.01
Col. & Hock. C. & I.	Ohio .	7,000,000	69,244	100	173,086	Feb. 1905	.25
Consolidated Coal..	Ill....	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidated Coal..	Md....	10,250,000	102,500	100	7,356,650	Feb. 1905	4.00
Empire S. & I., pf ..	N. J. .	5,000,000	23,700	100	462,450	Jan. 1905	1.50
Esperanza Oil	Cal...	125,000	125,000	1	2,500	Oct. 1904	.01
Fairmont Coal.	W.Va.	12,000,000	120,000	100	600,000	Feb. 1905	3.00
Four Oil.....	Cal...	500,000	300,000	1	90,406	Mar. 1905	.01
General Chem Com.	U S...	12,500,000	74,103	100	1,300,507	Dec. 1903	1.25
General Chem., pf. .	U S...	12,500,000	100,000	100	3,475,178	Apr. 1905	1.50
George's C'k Coal ..	Md...	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil	Cal...	100,000	100,000	1	507,500	Oct. 1904	.02½
Ill. Crude Oil	Cal...	200,000	200,000	1	12,500	Dec. 1904	.01½
Imperial Oil.....	Cal...	1,000,000	100,000	100	820,000	Apr. 1905	.20
Jeff.&Cl'f.C.&I., cm.	Pa....	1,500,000	15,000	100	255,000	Aug. 1904	5.00
Jeff.&Cl'f.C.&I., pf .	Pa....	1,500,000	15,000	100	713,000	Feb. 1905	2.50
Keystone Oil	Colo..	2,000,000	2,000,000	1	8,000	July 1904	.00⅔
Kern River Oil	Cal...	2,000,000	20,000	100	33,900	Mar. 1905	.15
Lehigh Coal & Nav.	Pa....	14,346,650	346,897	50	22,045,715	Nov. 1904	1.75
Maryland Coal, pf..	Md...	2,000,000	18,850	100	1,216,360	Dec. 1904	5.00
Monon.R.Coal, pf ..	Pa....	10,000,000	100,000	100	2,960,945	Jan. 1905	.77
Monte Cristo Oil ...	Cal...	500,000	500,000	1	100,000	Mar. 1905	.01
National Carbon, pf.	U. S..	4,500,000	45,000	100	1,968,750	Feb. 1905	1.75
New Central Coal ..	Md...	1,000,000	50,000	20	290,000	May. 1904	.40
Oil City Petroleum .	Cal...	500,000	500,000	1	45,000	Mar. 1905	.00½
Pacific Coast Borax.	Cal...	2,000,000	19,000	100	1,991,500	Mar. 1905	1.00
Peerless Oil	Cal...	1,000,000	92,000	10	383,440	Apr. 1905	.14
Penna. Salt	Pa....	3,000,000	60,000	50	13,810,000	Oct. 1904	3.00
Penna. Steel	Pa....	25,000,000	168,214	100	4,683,248	Nov. 1904	3.50
Phila. Gas., com ...	Pa....	28,953,029	579,061	50	5,411,271	Feb. 1905	.75
Phila. Gas. pf.	Pa....	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf ..	Pa....	32,000,000	297,012	100	10,915,191	Jan. 1905	1.75
Pocahontas Coll., pf.	W.Va.	1,500,000	15,000	100	310,000	Mar. 1905	.50
Sloss-Sheffield, com.	Ala...	7,500,000	75,000	100	187,500	Apr. 1905	2.50
Sloss-Sheffield, pf ..	Ala ..	20,000,000	67,000	100	2,322,250	Jan. 1905	1.75
Somerset Coal	Pa....	4,000,000	40,000	100	80,000	Feb. 1904	2.00
Standard Oil	U. S..	100,000,000	970,000	100	256,185,000	Mar. 1905	15.00
Tenn. C. & I., com..	Tenn.	22,553,600	225,536	100	1,327,680	May 1905	1.00
Tenn. C. & I., pf....	Tenn.	248,000	2,480	100	3319,04	Feb. 1905	2.00
Texas & Pacific Coal	Texas	2,000,000	20,000	100	1,930,000	Mar. 1905	2.00
Thirty-three Oil . . .	Cal...	500,000	100,000	5	400,000	Apr. 1905	.10
Union Oil.....	Cal...	10,000,000	52,672	100	1,042,430	Mar. 1905	.50
Union Nat'l Gas . . .	Pa....	9,000,000	90,000	100	1,260,000	Apr. 1905	2.00
U. S. Steel Corp.,cm.	U. S..	550,000,000	5,083,025	100	53,360,978	Dec. 1903	1.50
U. S. Steel Corp., pf.	U. S..	360,281,100	3,602,811	100	124,402,654	Feb. 1905	1.75
Va. Carolina Ch.,cm.	U. S..	38,000,000	279,844	100	3,678,829	June 1903	1.25
Va. Carolina Ch., pf.	U. S..	20,000,000	180,000	100	8,940,869	Apr. 1905	2.00
Westmoreland Coal.	Pa....	3,000,000	60,000	50	8,430,000	Apr. 1905	2.50

Canada, Central and South America, Mexico.

Name of Company and Location.		Author-ized Capital.	Shares. Issued.	Par Val $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia	Mex..	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Butters' Salvador, g	Salvé.	750,000	150,000	5	562,500	Feb. 1905	.25
Cariboo McKin'y, g.	B. C..	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Carmen, g. s.	Mex..	27,500	1,100	25	117,437	Jan. 1905	2.37½
Copiapo, c	Chile.	1,125,000	112,500	10	3,000,900	Oct. 1904	1.20
Crow's Nest Pass. .	B. C..	3,500,000	121,486	25	968,947	Apr. 1904	2.50
Dominion Coal, com	N. S..	15,000,000	150,000	100	1,050,000	Dec. 1903	1.75
Dominion Coal, pf..	N. S..	3,000,000	30,000	100	3,330,000	Jan. 1905	4.00
Dos Estrellas, g. s .	Mex..	150,000	3,000	50	856,515	Mar. 1905	13,73
El Oro, g.s	Mex..	5,750,000	1,080,000	5	2,708,800	July 1904	.18
Esperanza, s.g.	Mex..	2,275,000	455,000	5	1,431,749	Feb. 1905	.12
Granby Con.	B. C..	13,363,030	1,336,303	10	133,630	Dec. 1903	.10
Greene Con., c	Mex..	8,640,000	864,000	10	2,020,800	Feb. 1905	.40
Greene Con., g....	Mex..	5,000,000	500,000	10	100,000	Mar. 1905	20
Guggenheim Expl.	Mex..	17,000,000	105,000	100	1,653,750	Apr. 1905	1.75
LeRoi No. 2, g.	B. C..	3,000,000	120,000	25	403,200	Jan. 1905	2.48
Mex. Coal & Coke ..	Mex..	5,000,000	50,000	100	300,000	Dec. 1904	3.00
N. Y. & Hond. Ros .	C. A..	1,500,000	150,000	10	1,980,000	Mar. 1905	.03
North Star.....	B. C..	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St.& Coal, com	N. S..	5,000,000	50,000	100	788,600	Nov.1904	2.00
N. S. St. & Coal, pf..	N. S..	2,000,000	10,300	100	288,400	Jan. 1905	.10
Providence, g.s	B. C..	200,000	40,000	5	22,224	Oct. 1904	.10
Slocan Star	B. C..	500,000	500,000	1	575,000	Dec. 1904	.05
St. John del Rey, g .	Brazil	3,000,000	546,265	5	14,228,101	Dec. 1904	.12
St. Eugene Con	B. C..	3,500,000	3,202,000	1	338,080	Mar. 1905	.02
Tilt Cove, c	N. F..	1,000,000	89,000	2	21,360	Jan. 1905	.24
Tyee, c	B. C..	940,000	180,000	5	136,800	Dec. 1904	.48

NOTE.—These dividends are published gratuitously. Readers are invited to send any additions or corrections which they think necessary to complete our list

THE ENGINEERING AND MINING JOURNAL
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Cadmium in Spelter.

By W. R. Ingalls.

Almost all zinc ores contain traces of cadmium, and many ores contain it in considerable quantity, although rarely, if ever, commercially in such high percentage as is stated in the older metallurgical treatises. This subject is treated extensively in Jensch's monograph on Cadmium ('Sammlung chemischer und chemisch-technischer Vortäge,' III, vi, pp. 201 to 232) and in my 'Metallurgy of Zinc' (pp. 584 and 585). Jensch reported that in 10 years of investigation he had failed to find any Silesian ore with more than 0.3% Cd. and the mineral highest in cadmium that came under his notice was a lot of 208 tons of blende from Finland, which contained 0.46% Cd. The blende of Joplin, Missouri, is frequently richer in cadmium, as has been shown by Waring in analyzing samples of large lots. Average samples of many car-loads of ore from the Joplin district have shown from 0.33 to 0.72% cadmium.

The average run of spelter produced from the Joplin ore contains about 0.8% lead. In order to produce a metal more suitable to the requirements of the brass trade with respect to its lead content, the practice was inaugurated of reserving the first draw of metal for market as "brass special" or "extra select" or some other indicative name, and that procedure is now followed by most of the Kansas smelters, the second and third draws being still sold as "prime Western." The first draw of metal, being that which is distilled at the lowest temperature, is naturally lower in lead and higher in cadmium than the average of the entire distillation. A recent analysis of a certain brand of "brass special" showed 0.54% lead, 0.02% iron and 0.38% cadmium. Some of the best brands of that class of metal, however, carry as much as 0.5% cadmium, their lead content being under 0.5%. These metals are probably the richest in cadmium of crude spelters produced anywhere, which is due partially to the high cadmium in the ore, partly to the method of fractional distillation, and partly to other details in the furnace practice.

The influence of cadmium on spelter has recently been the subject of considerable discussion, which led me to make some inquiries among the brass makers of the United States. The results of these inquiries do not, unfortunately, throw any definite light on the matter. However, they are worthy of record as an initial contribution to the literature of the subject.

A prominent exporter of spelter reported that European brass makers have for a long time objected to cadmium, and that some good brands of American spelter have been unsatisfactory on that account. According to this authority, however, few if any American brass makers have made any complaint relative to cadmium. Nevertheless, complaints have been made, the chemist of one well-known brass company stating that "cadmium in zinc is an important matter, because we know that under certain conditions it causes trouble with the brass." Inquiry failed to develop the nature of this trouble, and the complaints are therefore indefinite.

More precise information is supplied by the chemist of another well-known brass company, who stated that he had observed that with two spelters containing nearly the same percentages of lead (about 0.1%) and of iron (about 0.01%), but one containing 0.15% of cadmium and the other no cadmium, the drillings of the cadmium-bearing spelter were brittle and easily broken up with pestle and mortar, whereas the drillings of the cadmium-free spelter were tough and malleable, and in order to reduce them to small chips for sampling it was necessary to cut them with shears. On the drill-press, the difference in behavior was more marked. The drillings of the cadmium-bearing spelter flew from the drill in small chips. The cadmium-free spelter, on the other hand, produced drillings which wound in helical form around the drill, forming ribbons 6 and 8 in. long. This correspondent remarks that his observations point to the conclusion that cadmium produces brittleness in spelter.

Much more extensive investigations, comprising determinations of all factors that might affect the result, would be necessary, however, before such a conclusion could safely be accepted, especially as to the effect of so small a percentage of cadmium. Nevertheless, it is on record in technical literature that the presence of cadmium in spelter in larger quantity than ordinary tends to make the spelter more brittle, giving it a fine-grained fracture, although it is said that spelter containing 15% cadmium may still be rolled. Spelter containing 40% cadmium is very brittle.

The supposition that cadmium in quantities no larger than are found in some American spelters would have no deleterious influence, either on spelter or the brass made with it, because of the similarity between the properties of zinc and cadmium, is supported by the specific report of a third chemist, who made a number of experiments, by adding known amounts of pure cadmium to pure brass of known composition, made from Lake copper and Bertha spelter. Additions of cadmium up to 0.5% failed to show any effect except a very slight increase in hardness after the maximum addition. The brass containing 0.5% cadmium produced good and sound castings, rolled well and was apparently equal to brass free from cadmium. This chemist expresses the opinion that cadmium in the proportion present in commercial spelters not only has no injurious effect on brass, but, on the contrary, may be rather a benefit, some experiments having indicated that cadmium acts more favorably than zinc as a deoxidant.

The chemist of another brass company, which is quite precise in its metal specifications, reported that his company in purchasing spelter has customarily specified that it should contain practically no cadmium, although the influence of cadmium on brass had not been investigated. He personally expressed the opinion that the amount of cadmium which usually occurs in spelter would not probably inconvenience the brass manufacturer.

Inquiry of some makers of ordinary brass showed that no attention at all was given to the quality of spelter in this respect.

All that can be considered to have been demonstrated by this investigation is that the high percentage of cadmium in American spelter has not attracted general attention as being an objectionable feature of the metal for the manufacture of ordinary kinds of brass. For some kinds of brass it is probably in no way objectionable. For some kinds of brass it may be objectionable, but whether because of its sole effect, or its effect in conjunction with other impurities, and in what way, and for what particular kinds of brass, are uncertain. It is to be hoped that there will be further investigations and contributions to the literature of this subject, since it is to the interest of both smelters and users of spelter to know the precise conditions.

In this connection it will be important to know how much of the cadmium in high-cadmium spelter actually goes into the brass and how much is volatilized, the temperature of the brass-melting pot being considerably higher than the boiling point of cadmium.

It is not impossible that a small percentage of cadmium in spelter, without having any material effect on that metal, might form some injurious compound with copper when the spelter is added to that metal. Dammer describes in his handbook a copper-cadmium compound occurring as a yellowish-white, very brittle, fine-grained, scaly substance, corresponding probably to the formula Cu_2Cd. At the melting point of copper the cadmium volatilizes completely. According to Stromeyer, small additions of cadmium make copper brittle. P. Denso states (*Zeitschrift für Elektrochemie,* IX, vii, 135) that molten cadmium, heated to somewhat over its melting point, quickly combines with small pieces of copper added to it, forming silver-white alloys, increasing in coarsely crystalline structure and brittleness as the percentage of copper increases. Denso's investigations show that these alloys contain varying proportions of a substance corresponding to the formula $CuCd_2$, containing 15.85% copper and 84.15% cadmium.

The Mesabi Iron Ore Range.—X.

By Dwight E. Woodbridge.

The iron-bearing districts of the Lake Superior region have been the special objects of study by the Lake Superior division of the United States Geological Survey. This work was organized in 1883, first under the direction of the late Roland D. Irving, and since 1888 under that of Charles R. Van Hise, now president of the University of Wisconsin. The work has cost the Government, all told, less than $150,000, and has been of great value to the public. As it has approached completion, and as the investigation of each separate district has come to a close, the survey has issued monographs detailing the results of its labors. Six of these have now been published, covering, respectively, the Gogebic, the Marquette, the Crystal Falls, the Mesabi, the Vermilion and the Menominee iron-bearing series. One volume is yet to appear, a final and comprehensive monograph of the general geology of the Lake Superior region, in which will be correlated the results reached in the several books so far printed. This publication will mark the completion of the original plan of the Survey—to map and describe the Lake Superior iron-bearing districts. Associated in this work with Messrs. Irving and Van Hise have been W. S. Bayley and H. L. Smyth, for the Marquette district; J. Morgan Clements and Messrs. Bayley and Smyth, for the Crystal Falls district; C. K. Leith, for the Mesabi; J. Morgan Clements, for the Vermilion; and W. S. Bayley, for the Menominee.

The Lake Superior region has been one of extraordinary difficulty from a geological point of view. Its rocks are pre-Cambrian; in these are no determining fossils, so that a valuable assistance in determining the relative age of the strata is lost.

The pre-Cambrian rocks probably differ in age far more widely than do those that are fossiliferous, but it is exceedingly difficult to dissociate them. The rocks occurring in the region are of the most varied character. They include plutonic and volcanic igneous rocks of many kinds; and various sediments deposited at widely separated periods; metamorphosis has been most profound. In some districts, especially the Vermilion and Marquette, igneous and sedimentary rocks are intricately intermingled and deeply changed in character. Folding and faulting have repeatedly occurred. There are, especially on both these ranges, the most intricate demonstrations of this on a magnificent scale, as well as of a size almost microscopic. While the Vermilion and Marquette ranges are at one end of the scale of complexity, the Gogebic and Mesabi are at the other; they are comparatively simple. The Gogebic has not even the blanket of a glacial covering to hide its character and hinder its determination. The Mesabi has been covered by glacial formations, and drift hides its rocks for many miles. The whole country is one of swamps and lakes, of tremendous forests whose undergrowth is thick and dense; and it has extensive areas of timber that has been felled by the winds and then partially burned, that are of the most impenetrable nature. Insignificant as it may seem to some, the plague of flies and gnats during the only season when study of the ground is possible is a serious matter, and the cause of a continual and nerve-wearing discomfort.

As has been stated by Prof. Van Hise, in a paper read before the Lake Superior Mining Institute, the working out of geological structure under these conditions, the determination of the formations in their relations one with another, the correct representation of their areal distribution upon the maps, the estimation of their relative economic importance, and the discovery of the principles that control the occurrence of ores within certain formations, can be accomplished only by exceedingly toilsome and patient labor, extending through years, by men of rare industry, much endurance and unusual ability.

The ores of the Mesabi range are found in the upper Huronian formation, therein differing from the neighboring Vermilion, which is geologically lower than any other Lake Superior formation, but corresponding in geologic age to the Gogebic. The Mesabi succession of formations is given by Leith as follows:

Upper Huronian (Mesabi Series)	Virginia slate (upper slate formation). Biwabik formation (iron-bearing formation). Pokegama formation (quartzite and quartz-slate formation).
(Unconformity) Lower Huronian	Granite, intrusive in lower formations. Slate-graywacke-conglomerate formation (equivalent to the Ogishke and Knife lake formations of the Vermilion district).
(Unconformity) Basement Complex or Archean.	Greenstones, including basalts, diorites, diabases, etc., hornblende-schists, and porphyritic granites and rhyolites.

The Mesabi, or Giant's, range—for the two words are synonymous, one being the English translation of the original Ojibway—is, properly speaking, composed of the older igneous and earlier sedimentaries of the above succession. Upon these rest the Huronian sediments of the region, iron-bearing or not, as they may be. These rocks rest, some with eruptive contact, some with normal erosion unconformity, upon the Archean basement. Their older portions lie close to the core rocks of the main range, the younger farther from them to the south. The rocks of the district are best exposed on the upper slopes, where they are mainly igneous, though partly the oldest sedimentary. On the lower slopes, where the rocks are sedimentary, they are universally covered by glacial drift. As the formations are sharply separated the Mesabi can be called the type pre-Cambrian district of Lake Superior.

In his 'Mesabi Iron-bearing Rocks,' published as 'Bulletin X' of the Minnesota Survey, in 1894, J. E. Spurr declared that the iron of the range and its various associated cherts, cherty carbonates, paint-rock and ferruginous slates had all been derived from the alteration of a rock containing hydrated ferrous silicate, which he assumed to be glauconite. This assumption was largely upon the testimony of Dr. J. E. Wolff, of Harvard University. Mr. Spurr's declaration has been later combated by Leith in the 'Mesabi Monograph' of the United States Geological Survey; he points out that this mineral could not be glauconite, as it contains no potash, while glauconite is essentially a potash mineral. Leith, therefore, assumed it to be a new mineral, which he called greenalite. But in justice to Spurr it must be said that he was considerably puzzled over the almost entire absence of potash, and stated (page 235): "Chemically it is essentially a hydrous protosilicate of iron, with a small amount of alumina, variable small amounts of calcium and magnesium and trifling quantities of the alkalies. Chemically it seems more closely related to glauconite than to any other mineral, and differs chiefly in the absence of the usual larger amount of potash. Another way in which it differs from the ordinary glauconite is that the iron here is normally in the protoxide state, while in nearly all the reported analyses of glauconite it is mainly sesquioxide."

The various theories of a chemical origin of the ores have been more earnestly urged than any others and have met with more general acceptance. The earliest theory, advanced first for the Vermilion, and later extended to the Mesabi, even before any economically important discovery in the latter district, assumed the ores and the iron-bearing rocks to have been precipitated in practically their present condition, and to have undergone little change since that time. This theory explained the origin of the banded silica and iron by direct precipitation from the waters of a hot primordial ocean, highly saturated with the minerals of the crust with which they came in contact. Changing conditions produced from these waters alternating precipitation of iron and of silica. These alternations continued throughout the whole period of the formation of the iron-bearing rock, and the banding thus represents original stratification.

But later and more scientfiic study that became possible with the more extended development of the Mesabi range seemed to show that the bands of iron and silica grew by processes of concentration subsequent to original stratification, in which

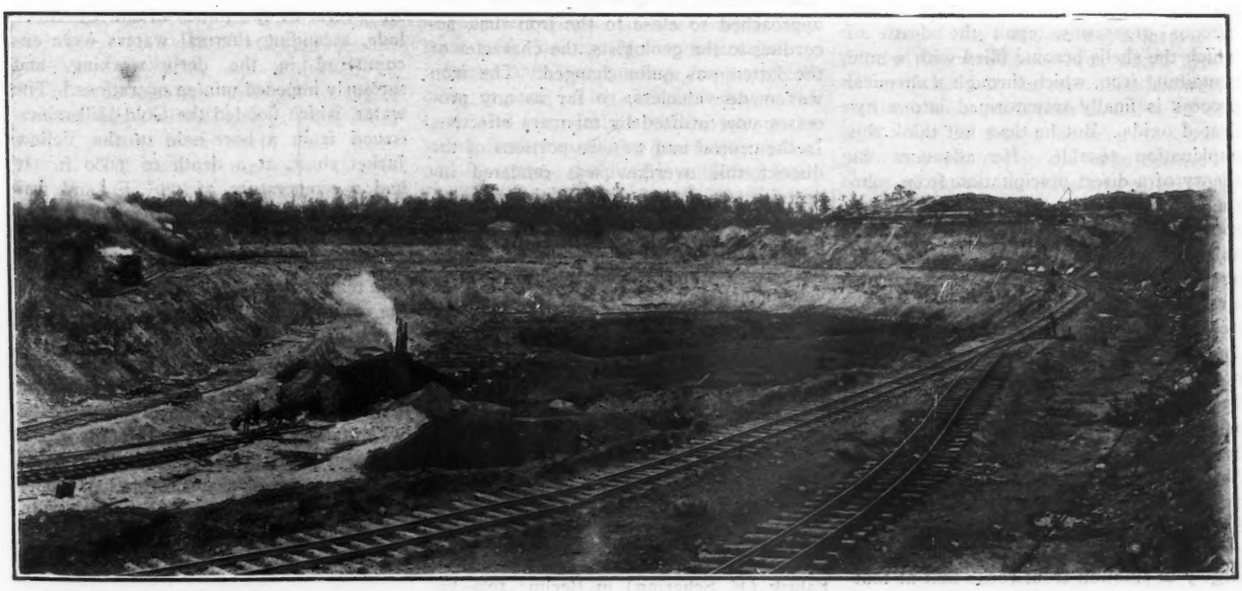
the agency of oxygenated and carbonated percolating, underground waters has been most conspicuous. Then, again, the earlier Huronian sediments upon the Mesabi range were of sand, that is now shown to have been inappreciably affected by such corrosive action as would have resulted from their contact with waters of a heated, acid ocean.

In the 'Twenty-first Annual Report' of the United States Geological Survey, Prof. Van Hise considered the cherty carbonates as the primary rocks of the Mesabi. This associates them with the evident origin of the Michipicoten ores. He stated that the studies carried forward had gone far enough to show several conclusions. Among these was that pitching troughs underlain by impervious layers are beneath every ore deposit. Also that brecciation of the formation accompanies cross folding; that the troughs do now, as in the past, serve as trunk channels for the circulation of underground water. Further, "that in the unaltered parts of the iron-bearing formation we find ferrous silicate and siderite rocks, and in the altered parts textures and structures indicating the previous presence of these rocks." That—and here is the crux of the accepted theory—"such rocks contain iron in a form favorable for its easy oxidation or solution by underground water." All of these conclusions pointed to one explanation of the ore deposits. Iron, from carbonate and silicate, taken into solution by the descending waters, was carried into the pitching troughs and there met other waters more highly oxygenated, which precipitated the ore. Silica was dissolved simultaneously, or even more rapidly, the process favored by the large amounts of water in the troughs. Meteoric waters, entering the formation at its higher northern edge, passed through the pervious cherts on the gentle dip of the formation to the edge of the impervious slates and there ascended to the surface, leaving their burdens of iron. The chief deposits have been found where the waters were more at rest, and where they had not been robbed of oxygen.

Now C. K. Leith, in 'Monograph XLIII,' states that there is "carbonate associated with greenalite in the Mesabi district, and it is not impossible that the Mesabi concretions may have developed from carbonates, though no direct evidence of this has been observed." Leith apparently discards a portion of the recent Van Hise theory as to cherty carbonates as the origin of the iron, and inclines toward chemical oceanic precipitation, put forward by H. V. Winchell.

The whole Mesabi range is, of course, a splendid example of secondary enrichment. Despite the various apparently contradictory theories of geologists upon the origin of its ores, these geologists have

STEVENSON MINE, WITH SIX STEAM SHOVELS AT WORK.



ADAMS MINE—OPEN MILLING PIT.

remained remarkably close together upon important points, and, with the exception of an idea as to vulcanism, tentatively put forth recently, that need not be seriously considered, have differed chiefly as the result of additional light which has been thrown upon genesis by the work of mining companies and students of the region. Winchell, so far back as 1892, first noted the deposition of ores in troughs by the action of percolating waters, upon the impermeable quartzite of the upper Huronian. As time has advanced, more and more emphasis has been placed upon the fact that, while the primary control of the water circulation has been exercised by the broad, shallow synclines of the main iron formation, other factors have had a marked effect upon individual depositions of ore. These factors include faults and fractures, detached areas of slate and granite, the overlying carbonaceous slates and similar local variations.

It is interesting for us laymen to note the conclusions of the geologists regarding the source of the greenalite which was the originating rock of the iron formation, and out of which have come the vast Mesabi deposits, covering hundreds of millions of tons, of such overwhelming importance to the nation and mankind. Leith considers the probable development of greenalite, suggesting several explanations. The first of these is that it is derived in a manner analogous to the development of glauconite, "which," says Mr. Leith, "is not at all clear"! But he quotes from various authorities to the effect that glauconite may be derived from the interior of calcareous organisms, upon the death of which the shells become filled with a mud containing iron, which through a chemical process is finally transformed into a hydrated oxide. But he does not think this explanation tenable. He advances the theory of a direct precipitation from solution by organisms; the iron having been contributed to ocean waters in considerable abundance, necessarily through the agency of acid waters, therefrom abstracted by minute organisms, and deposited thereby in some such form as glauconite or greenalite. It is worth while noting, with this suggestion, that earlier one of chemical precipitation from a hot primordial ocean. Another idea advanced by him is that the green granules of the Mesabi originated similarly to the iron carbonates of other portions of the Lake Superior region. In other words, that the iron and silica were brought into the ocean largely in solution from rocks that at that time formed its shores, and which contained disseminated iron. The Archean greenstone, a main rock of the region, then formed a large portion of the shores of the primordial ocean, and this rock still shows from 7 to 10% of metallic iron, largely in the ferrous condition. Ordinary weathering decomposed these rocks, and the iron contained therein was taken into solution. This ferrous iron was oxidized and precipitated and the natural chemical changes followed, aided by abundant vegetation and consequent carbonation.

Finally, all this iron-formation material was buried under thousands of feet of mud, estimated at as high as 2½ miles in thickness. This became a slate, and when uplifted began to erode at once; at length the iron formation became subject to weather. To the fact that this was subsequent to Keweenawan time, in the case of most of the district, is due the presence of merchantable hematites along a large part of the Mesabi range, and not titaniferous magnetites everywhere, as found east of T 59. The concentration of ore began after the exposure of the formation, and has continued to the present time. Indeed, the process of the manufacture of merchantable iron ore is still in progress on an important scale, in that vast and wonderful laboratory of nature. The erosion by glacial action has been referred to in a previous chapter of this series. It was very marked. It was by no means the only hindrance and unfavorable agency in the formation of iron-ore beds. There were several periods in which the rocks of the district were covered to a great depth by subsequent formations, all of which had to be stripped off by erosion before concentration could recommence. The long eastern section of the region is a part the relative importance of which, could it have received the same treatment as did other portions, would have been shown to be enormous. It was covered by a tremendous overflow of liquid igneous rock. This approached so close to the iron that, according to the geologists, the character of the latter was quite changed. The iron was made valueless, so far as any processes now utilized by man are effective. In the central and western portions of the district this overflow was rendered innocuous, by reason of the thickness of slate between it and the iron. I think we do not appreciate the vast quantities of iron that were ruined—for immediate development, at least—by this gabbro overflow, nor the other enormous tonnages that have been carried away and lost by the glacial action of the great ice age.

GERMAN CHEMICAL PROFITS.—Further reports show that operations last year have been satisfactory enough to continue the rate of dividends declared in 1903, and in some instances do better. A 16% ordinary dividend and one of 4.5% on the preferred stock has been paid by the Chemische Fabrik (E. Schering) in Berlin; 12% by the Oranienburg Joint Stock Chemical Company, and 9% by the Goldenberg Geromont Chemical Company, of Winkel, in Rheingau. Judging from present orders, and averaging the prices paid, profits in 1905 will show improvement.

There are oil indications in more than thirty counties in Texas.

Ore Deposits in Relation to Thermal Activity—II.*

By JAMES PARK.

The Ohaeawai hot-springs cinnabar deposits, although never likely to be turned to economic account, are of great scientific importance from the light which they throw upon the processes of ore formation by volcanic after-actions. The deposits are still in process of formation, and metallic sulphides have been, and are still being, deposited in underground fissures, and at the surface, together with the sinters which form the matrix. The hot springs and fumaroles owe their existence to the eruption of the basalt, but the basalt is manifestly not the source of the metals. The source may not be deep-seated, but that it exists at some distance below the flow of basalt is almost certain.

The waters of these thermal springs were found by Captain Hutton, in 1870, to contain zinc, manganese, silica, free sulphuric and hydrochloric acids, but no traces of mercury.[1]

A sample of the water analyzed by W. Skey, in 1896, gave the following results:

	Grains per gallon.
Protoxide of iron	2.23
Lime	5.97
Magnesia	1.15
Silica	3.10
Sulphuric acid	13.60
Hydrochloric acid	66.91
Sulphureted hydrogen	traces
Alkalies	41.66
Ammonia	traces
Organic matter	traces

Abundant evidence of the hydro-thermal origin of veins traversing eruptive rocks is also obtainable in Europe and America. In several of the mines in the Comstock lode, ascending thermal waters were encountered in the deep working, and seriously impeded mining operations.[2] The water, which flooded the Gold Hill mines, issued from a bore-hole in the Yellow Jacket shaft, at a depth of 3,080 ft. It had a temperature of 170° F., and was heavily charged with hydrogen sulphide.[3] Baron von Richthofen,[4] who examined the Comstock lode, at a time when no abnormal temperature was noticeable, ascribed the origin of the lode to earlier solfataric action.

The quicksilver mines at Sulphur Bank, in California, furnish important evidence in relation to the genesis of ore deposits by solfataric action. At this place the basement rocks are slates and sandstones, overlain by a fresh-water formation, which, in turn, is capped by a flow of basalt. The sandstone and slate are broken and fissured in such a way as to form a

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*Abstract from 'Mining Geology,' by Professor James Park, director Otago University School of Mines. *The Australian Mining Standard*, January 26, 1905.

[1] F. W. Hutton, 'On the Occurrence of Native Mercury near Pakaraka, Bay of Islands.' *Trans.* New Zealand Institute, Vol. III, p. 251, 1871.

[2] Clarence King, U. S. Geological Exploration of 40th Parallel, 1870, p. 87.

[3] George F. Becker, 'Geology of the Comstock Lode,' U. S. Geol. Survey, 1882, p. 230.

[4] F. von Richthofen, 'The Comstock Lode, its Character and Probable Mode of Continuance in Depth,' San Francisco, 1866, p. 54.

breccia. The interspaces are filled partly with a still soft or already indurated silicious paste, containing finely disseminated metallic sulphides, and partly with cinnabar, for the most part in coherent crusts.[5] In the same mine the basalt is reduced to a porous mass, and traversed by irregular fissures, filled with sulphur and cinnabar.[6] Hot mineral water and gases, carrying H_2S, force their way through the interstices of the deposit in the fissured sandstones and slates. The silica deposits are found in all stages of consolidation from a gelatinous mass to chalcedony, and alternate with layers of metallic sulphides, consisting of cinnabar and pyrite. Unfortunately no information is obtainable as to the nature of the fresh-water formation lying between the Cretaceous sandstone and basalt.

According to Becker, the hot water is rich in chlorides, borax and sodium carbonate. The gases liberated from the water consisted of 893 parts CO_2, 2 parts of H_2S, 79 parts marsh gas (CH_4), and 25 parts nitrogen. According to Dr. Melville, the marcasite, associated with the cinnabar, contained traces of gold and copper; and in the efflorescence from the mine workings, Becker detected traces of cobalt and nickel. In the upper zone only sulphur was found; further down, sulphur and cinnabar; and in depth, cinnabar and pyrite occurring upon or within deposits of silica.

The Steamboat Springs, in Nevada, furnish equally important evidence of vein-filling by hot-spring action. They have been fully described by Le Conte,[7] Becker,[8] and other writers. In a valley surrounded with eruptive rocks, and underlain by altered sedimentaries, believed to be of Archean age, thermal springs issue from several points from north and south fissures. The floor of the valley is covered, in places, with a sheet of calcareous sinter, in which there are many fissures, here and there still open, but mostly closed by the deposit of silica on their walls. From some of the springs hot vapors and gases, chiefly CO_2 and H_2S, still issue. Becker found, in the mineral water, small amounts of mercury sulphide and sodium sulphide. About a mile to the west of the main group there are similar fissures yielding steam and CO_2. In the sinters of these occur several metallic sulphides. Becker analyzed the filling of several fissures, and found, besides hydrated ferric oxide, lead, copper and mercury sulphides, gold and silver, and traces of zinc, manganese, cobalt and nickel.

[5] J. Le Conte, 'On Mineral Veins Now in Progress at Steamboat Springs Compared with the Same at Sulphur Bank,' *Amer. Jour. of Science*, Vol. XXV, p. 404.

[6] Prof. F. Posepny, 'The Genesis of Ore Deposits,' *Transactions* American Institute Mining Engineers, Vol. XXIII, p. 197.

[7] J. Le Conte, 'On Mineral Veins Now in Progress at Steamboat Springs Compared with the Same at Sulphur Bank,' *Amer Jour. of Science*, Vol. XXV, p. 424.

[8] G. F. Becker, 'Geology of the Quicksilver Deposits of the Pacific Slope,' U. S. Geol. Survey, Washington, 1888, p. 331.

The occurrence of metallic sulphides in the sinters at Sulphur Bank, Steamboat Springs and Ohaeawai; the mushroom-capped lodes at Waihi and Great Barrier island; the tree-stems replaced by sulphides, found in veins at great depth below the present surface, afford conclusive evidence of the filling of veins by hot ascending waters and gases in areas occupied by later eruptive rocks.

It is a well-known circumstance that ore deposits are most common in the neighborhood of extended zones of igneous rocks, as in Hungary, Transylvania, Nevada, Colorado and New Zealand, where the vein-bearing rocks are principally andesite, phonolite and trachyte. In other rocks veins are fewer and more scattered. For veins in the altered later eruptives, Lindgren suggests the name propylite veins, but it is doubtful whether the genetic difference between them and true fissure veins is sufficiently marked to justify the distinction. Moreover, the roots of propylite veins will be difficult to distinguish from fissure veins connected with a plutonic intrusion.

Suess,[9] speaking of the importance of the rôle played by the waning phases of volcanic phenomena in the formation of mineral veins, says: "Hot springs may be taken as the latest phases of a whole series which led up to the present deposits of ore."

Fumaroles.—In this class are grouped deposits of sulphur, ferric chloride, cupric oxide and boron salts, formed by the escape of steam and gaseous emanations in volcanic regions. Of these, sulphur and boric acid alone are of economic value.

Boron salts are common in many volcanic regions. The entire production of boric acid from Italy is obtained from the steam fumaroles in the provinces of Pisa and Grosetto. Sulphur is sublimed from fumaroles and craters by the mutual reaction of hydrogen sulphide and sulphur dioxide. It is found impregnating vesicular lavas, tuffs and silicious sinters, and mixed with volcanic muds and gypsum deposits.

The most important known deposits of sulphur occur in Italy, Spain, Hungary, Chili, Mexico, Japan, United States and New Zealand. The sulphur deposits of Italy occur in veins or lenticular masses, in rocks of miocene age, chiefly in the provinces of Caltanisetta, and Girgenti. In Nevada the sulphur-bearing rock occurs in beds lying between limestone and magnesian rocks. In Utah the sulphur occurs associated with gypsum, near an old crater. At Tikitere, in New Zealand, there are extensive deposits of sulphur in an old crater. A large proportion of the sulphur is the black amorphous variety. The heat of the fumaroles and hot springs is too great to permit the excavation of the sulphur to a greater depth than six or eight feet.

[9] Eduard Suess, 'Lectures', *Royal Geographical Journal*, Vol. XX, November, 1902, p. 520.

At White Island the deposits of sulphur occur in and around the crater lake, mixed with gypsum. The crater water is hot, and highly charged with free hydrochloric and sulphuric acids. The gypsum is deposited in crystalline incrustations, on the sides and floor of the crater lake. The source of the lime has not yet been determined, but the supply must be constant, as gypsum is being deposited continuously. The sulphur is deposited in the water from gas springs, which are seen bubbling everywhere in the floor of the lake; and also from fumaroles around the margin of the crater.

The Osmium Lamps.

The 'Auer Os,' as it is called, from its inventor Herr Auer von Welsbach (who also invented the mantle of thorium and cerium), is constructed of a filament of metallic osmium. This is a rare element, the first of the heavy-platinoid group, including osmium, iridium and platinum. Osmium as a metal has had, till recently, but little use, except in such restricted ways as the osm-iridium point for gold pens. Of its chemical compounds, the only one that is fairly common is the tetroxide ('4-oxide') OsO_4, or 'osmic acid,' as it was popularly but inaccurately called; this is used in staining thin sections of organic tissue in microscopic work. Some peculiarities of this oxide are, that it is readily formed by heating the metal, that it is volatile, and worst of all that it has occasioned bad accidents to eyesight. The vapor of this tetroxide on touching the cornea of the eye of the careless experimenter is reduced to metallic osmium, which forms an artificial but unremovable 'cataract,' resulting in a permanent clouding of the sight. On the whole, however, the metal peacefully reposed in the large cabinet of chemical curiosities, till it was called upon to furnish a luciferous filament in competition with the ordinary incandescent carbon lamp. At 37 volts, and 1.5 watts per c.p., the filament is 280 mm. long and has a diameter of 0.087 mm.; it thus appears that a pound of osmium can furnish many thousand lamps. The difficulty of making a thin and even thread was overcome by mixing the finely divided metal with a thick paste of some sticky organic compound; this was forced through a die made of diamond or sapphire, emerging as a filament, which was then charred in a steamy reducing atmosphere. Osmium is brittle when cold, but soft when heated. The life of the lamp has frequently extended beyond 5,000 hours. The rival in metallic-filament lamps is that made of tantalum, but both are in the state of promising experimentation. Fritz Blau recently read an authoritative paper on this subject before the Elektro-technische Verein of Berlin.

The total oil production of Texas in 1904 was 20,044,500 barrels.

Dumping Devices.

By W. R. Crane.

No single phase of mining merits more attention than the handling of ore, both above and below ground. In fact, so important is this work that the profitable exploitation of an ore deposit often depends upon this factor, or, as is more usually the case, a method of working has to be chosen to suit the convenience of handling rather than that of mining.

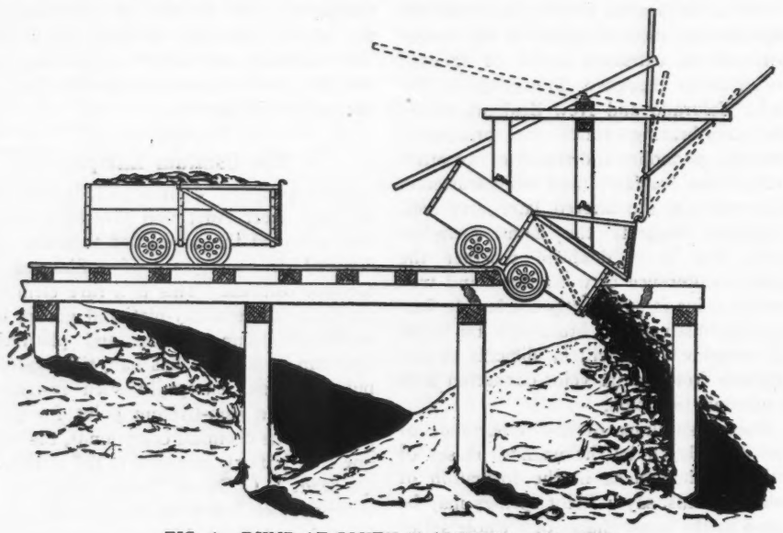


FIG. 1. DUMP AT SOUTH McALESTER. IND. TER.

A few designs of dumping devices or tipples, largely employed at the present time in discharging the contents of cars, are here discussed. The designs cover a wide range in the character and amount of materials handled; that is, they are in operation in both metalliferous and non-metalliferous mines.

There are a number of factors which control and modify the design, the most obvious being utility, strength, durability, and cost. The usefulness of a dump is dependent upon its simplicity and ease of operation, but it does not necessarily follow that the simplest constructions are the easiest to operate. Simplicity is of prime importance, owing to the extremely hard usage to which such apparatus is continually subjected, and, as a rule, the 'dumps' that have survived the test of time are simple in construction—an important requisite, as it is necessary to repair them often. Simplicity, strength and durability are closely related factors in the construction of 'dumps,' but care must be taken in working for strength to guard against designs which are cumbersome and bulky. The foundations must be strong, otherwise the running of cars, on and off, will be seriously hindered, through the parts getting out of line.

As cost is the gauge whereby all economic operations are measured, it has a controlling influence in the design. If by means of a particular dumping device the services of even one workman are dispensed with, its usefulness and importance have been enhanced by just so much. The cheapness of a dump often leads to the handling of mineral at needless expense per ton, where the expenditure of a slightly larger sum in first equipment might so reduce the operating cost that the resulting saving would not only return the original expenditure, but lighten the running expense.

The various forms of side or end-dumping cars, mostly metal, that are coming into common use, especially in metal mines, are largely doing away, in such places, with dumping devices, such as are necessary when the axles and bodies of the cars are securely bolted together. There are objections, however, to their use, such as increased height above rails, narrow gauge, and short wheel-base, thus requiring the haulage ways to be moderately high and rendering the cars unstable and less suitable for train or power haulage. Their advent has affected individual dumps only, and in metal mines, or those lodes of such thickness as to permit high haulage ways. For thin horizontal deposits, especially, and in deposits of small economic value, more rapid methods of handling must be employed, such as train-haulage and automatic, cage or cradle, dumping. The result is a large number of cars with an increased cost for maintenance. High first cost usually excludes self-dumping cars from general use in thin (and often thick) low-grade deposits.

The types of dumps may, for convenience, be grouped into the following classes: (1) the stepped; (2) the pivoted or rotary, the movement being transverse to the track; (3) the rocking or chair forms; and (4) the revolving or cradle types, with which the movement is longitudinal with the receiving track. The two first mentioned are the forms most commonly used, being employed both at the surface and underground; the third form is used almost exclusively in the top works; while the cradle form is of large capacity, handling either one or an entire train of mine cars, and it is occasionally employed by the railroads.

Besides these forms, there are the cross-over and push-back dumps, which, together with skips, are largely automatic in their action. A number of other 'dumps' are also automatic or semi-automatic, but an attempt to clasify them would only result in confusion.

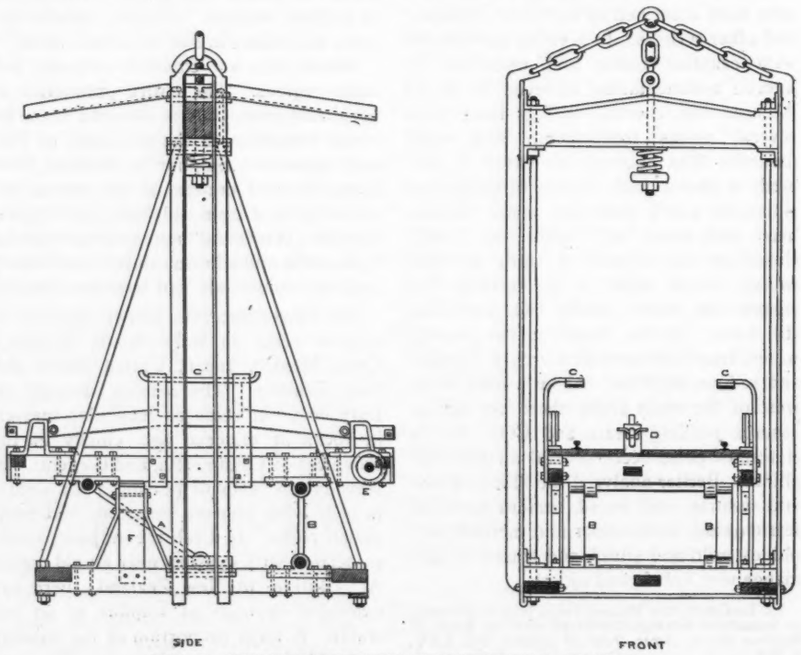


FIG. 2. DUMP CAGE USED AT PITTSBURG, KANSAS.

A type of the stepped form of dump is

shown in Fig. 1. It is not as commonly used as those of the second class, but takes less power to operate. The tipping of the car, preparatory to dumping, is practically automatic—dumping actually taking place when the door of the car is opened, which may be done before or after the change of inclination, and is accomplished by the powerful lever arrangement shown. The usual step-down or drop of the front wheels is 12 to 14 in. This arrangement is employed at one particular mine for dumping waste and requires but one person to operate it, while formerly, previous to its installation, three men were employed, thus bringing about a saving of at least $3 per day. The first cost of this dump complete was $20, but its usefulness is lessened by the effort necessary to get it back upon the level track.

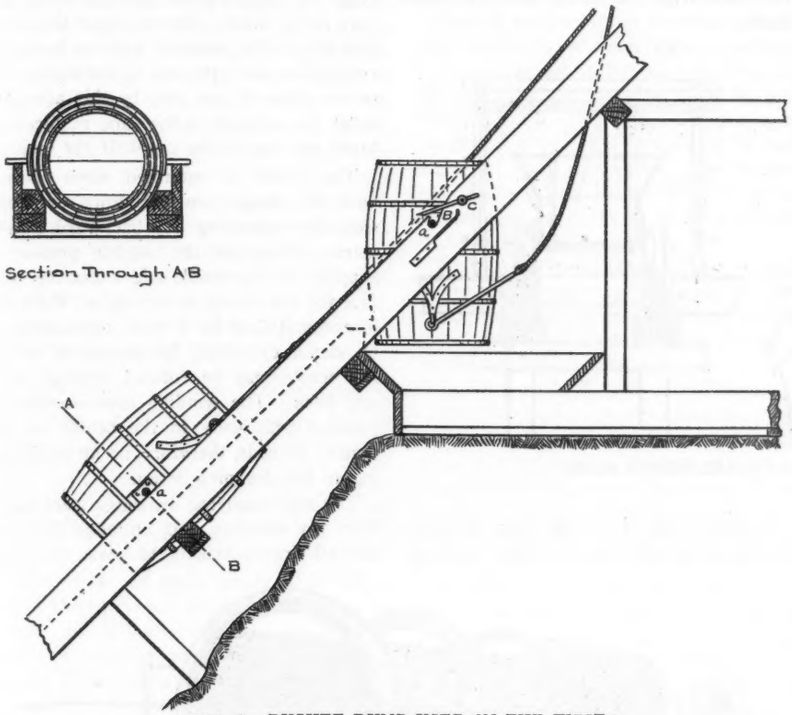


FIG. 3. BUCKET DUMP USED IN THE WEST.

The pivoted forms are extensively used, particularly about coal mines and similar deposits. A common form consists of a small platform, about the length of the car, which has mounted upon it short sections of track, the ends of which protrude at one end and are formed into hooks ('goose-necks') to conform with the curvature of the tread of the car-wheel. These rails are securely fastened upon the platform, which is pivoted upon a shaft or rod, so placed that when the loaded car is run upon it and has been stopped by the curved ends of the rails, a slight upward pull at the rear end causes both car and platform to rotate upon the supporting rod and assume any angle desired. All that remains to be done is to unlatch the door of the fore end of the car, when the contents will be discharged. The unlatching or raising of the car-door is usually done before or during the change in inclination. The return of the car and platform to a horizontal position is automatic—the center of gravity changing with the discharge of the contents. As a rule these dumps are so closely balanced that when a loaded car is in place a pull of only a few pounds is all that is necessary to cause the change of inclination, which may, and often is, accomplished by running the car upon the dump with a quick push—the momentum furnishing the force necessary for dumping; but this is not good practice, because it tends to wreck the dumping mechanism, and in case of steep dumping inclinations it may even throw the car into the receiving chute or into the ore-bin.

A majority of the automatic dumping cages belong to this class, a type of which is shown in Fig. 2. The fore and rear ends of the false or dumping bottom are controlled by links, *A* and *B*, of unequal lengths, by means of which a differential movement is obtained. That end (the rear) having the longer set of links, *A*, moves through a greater distance, in response to the same actuating force, than does the other or fore end, which has the shorter set of links, *B*. Considerable inclination is thus obtainable with but a slight vertical movement of the cage proper. A car is run upon the cage at the foot of the shaft and is held in place upon the track by straps, *C*, above the tread of the wheels and by stops or clamps, *D*, attached to the bottom of the cage, which prevent the car from moving upon the track by gripping the axles. The tilting of the bottom of the cage, and with it the car, is accomplished by means of rollers, *E*, placed on either side of the fore end of the bottom, which run between curved guides at the point of dumping. While hoisting, the bottom rests upon stools, *F*, and is securely held in place by the links. This form of automatic dumping cage is strong, stable while hoisting, and positive in its dumping action. Such cages are largely employed throughout the bituminous coalfields and save operating expenses, although the wear and tear on the cages and the increased strains on the hoisting ropes, due to the shock of dumping, tend to shorten the life of those parts.

The principal objection to cage-dumping is that, unless great care is taken, the coal or mineral is thrown from the car with such force as to produce a high proportion of 'smalls,' also increasing the wear upon the chute and contained screens.

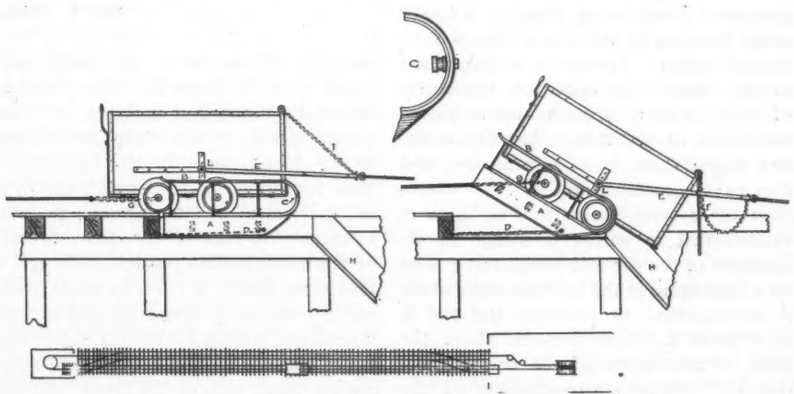


FIG. 4. DUMP AT SOUTH KEARSAGE SHAFT, MICH.

Another type, as applied to bucket hoisting, especially of water, is shown in Fig. 3. Here the dumping is also practically automatic, the bucket being raised

on the skids until the hub or leveling-pin, *A*, falls into the notch *B*, when, on loosening the rope, the bucket dumps, further hoisting raises the pin out of the notch, over and above the lever *C*, which, when released by the passage of the pin, falls or is thrown back, thus bridging the notch for the return of the bucket to the pit.

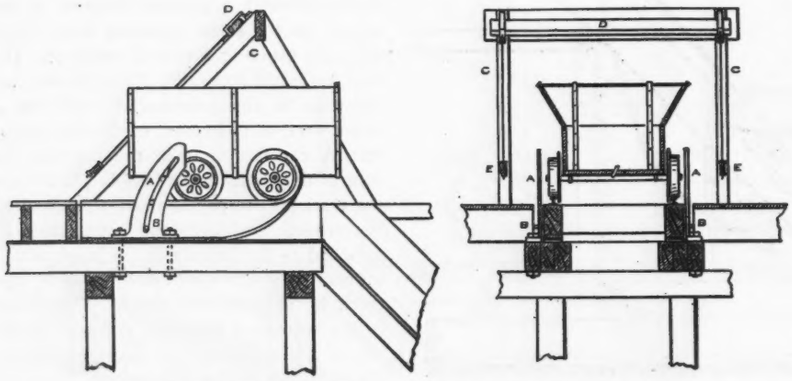


FIG. 5. IRON ORE DUMP CLEVELAND-CLIFFS MINE.

Rocking or chair dumps bear a striking resemblance to the rotary forms, differing, however, in the one important particular, that there is no fixed point of rotation; thus any point in the dump describes a curve which approximates the arc of a spiral. Two types of this form are shown in Fig. 4 and 5. They are, as a rule, employed with larger and heavier cars than those previously mentioned. The forms shown in *A*, Fig. 4, dumps cars of 4 to 6 tons capacity, and that, too, without connection being broken in the endless rope-haulage system employed in transferring the cars between the shaft and mill. (See *B*, Fig. 4.) The dump is prevented from being dragged forward while dumping by the stay-chains *D* (one on each side). Previously, a second set of stay-chains was employed, the object of which was to prevent any backward movement of the dump; but experience has shown them to be unnecessary, and they have been discarded.

In the system shown in Fig. 4, it is evident that to permit a change in inclination of the car and dump, there must be a slackening in the haulage rope, which is accomplished by attaching the bail *E* at a point *L*, some distance above the point of attachment of the rear connection *G*. Sufficient strengthening of the rope is thus produced to allow the car to readily assume the proper angle for dumping. This system is also automatic and works with remarkable precision and smoothness.

Present practice favors the use of bumpers or cushions, *C*, in the 'goose-necks,' which diminish the shock of the stopping of the car and further aid in starting the recovery, when the car has been emptied. No stop for the car is necessary in the form shown in Fig. 4, as any movement beyond a certain inclination will be resisted by a shortening of the connections. After dumping, the center of gravity is so changed as to cause the dump and car to right themselves; when the car can be run back from the dump upon the main track.

Another form of rocking dump is shown in Fig. 5, which requires hand work in running the car on to the dump and a slight effort to dump it. Stay-chains are replaced by cast-iron uprights, *A*, placed on either side of the dump and fastened to the foundation. In the uprights are slots so formed as to permit pins, *B*, set in the sides of the frame, to work in them. No back or forward movement of the dump is then possible, although, as previously stated, a curved runner standing in front of the pins is all that is really necessary. A stop for the car is provided, which consists of two A-frames, *C*, standing on either side of the dump, and supporting a sliding beam, *D*, connecting them. The beam is furnished with a spring attachment *E*, at both ends, which not only holds it in place, but presents a positive and flexible stop for the car when it has reached a certain inclination. It is also adjustable, thus allowing a change in inclination. After dumping, the arrangement rights itself by a shifting of the center of gravity.

Cradle-dumps were first employed in emptying single cars of rather large capacity, such as railroad cars, but are now used both as individual and multiple car dumps for the ordinary mine cars. A cradle-dump for a whole train of cars is shown in Fig. 6, and is applicable for slope or engine-plane haulage only, the cars being drawn directly from the mine into the cradle, emptied without breaking connection, and returned to the mine. An entire train of cars can, by this arrangement, be emptied in the time required to break connection for one-half the train.

The cradle is mounted upon wheels with the flanges on the down or slope side, thus opposing any backward movement. Rings on the outside present a support for the cradle and a bearing surface for the wheels to run upon. Rotation is accomplished by a wire rope actuated by steam cylinders, by means of which the cradle may be rotated through 180° and back. The winding rope occupies a position practically in the center of the cradle; there is, therefore, no undue bending in the dumping action.

The accompanying drawings were made from my sketches, and, although they are not all drawn exactly to scale, yet they probably bring out the idea of design and operation fully as well as if so made.

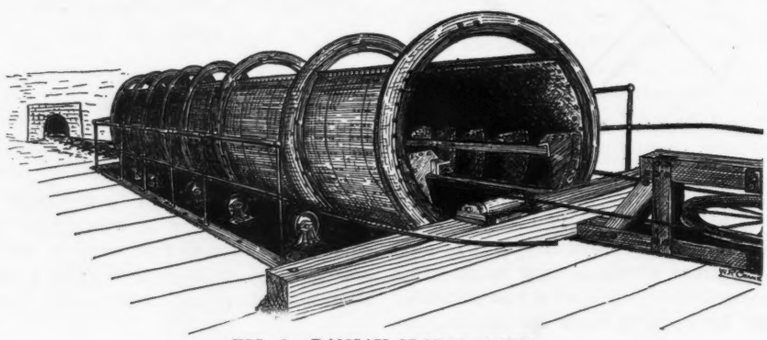


FIG. 6. RAMSAY CRADLE-DUMP.

NEW CALEDONIA.—An anonymous letter from New Caledonia, in a recent issue of *L'Echo des Mines et de la Metallurgie*, is written in a very despondent mood regarding the recent history and immediate prospects of this Gallic colony in Polynesia. The mining industry flourished as long as the system of penal deportation from France was in vogue. The recent attempt to develop coffee and other agricultural products has not been fortunate in finding a market, and the island is overburdened with superfluous and useless government functionaries. The cobalt mines are almost closed; the nickel mines will soon follow, and commercial coma threatens. There is an opportunity here for energetic and timely reorganization and action. The writer calls for a return to the budget of 1894, a reduction of tariff charges, and general official economy.

Mineral Production of Quebec.

Through the courtesy of Mr. J. Obalski, inspector of mines of the province, we have received advance copies of his report, giving the mineral production of Quebec for the year 1904.

The production of metals included 20 oz. gold, obtained from prospecting operations in various streams. No systematic operations were carried on in the Beauce district during the year. The output of pig iron was 11,121 tons, made in the charcoal furnaces at Radnor and Drummondville. In making this iron there were used 24,857 tons of iron ore, 3,003 tons limestone, and 1,446,607 bushels charcoal. Of the ore used, 16,132 tons were bog ore from Radnor and neighborhood, 200 tons hematite from Bolton township in Quebec, 8,705 tons from Ontario.

The production of minerals for the year is reported as follows:

		Quantity.	Value.
Bog iron ore	Tons.	16,152	$54,884
Titaniferous iron ore	"	100	300
Chrome ore	"	6,429	71,499
Copper ore	"	23,729	95,000
Asbestos	"	35,479	1,186,795
Asbestic	"	13,149	13,124
Mica	lb.	301,565	85,024
Ocher, calcined	Tons.	1,590	18,825
Graphite	"	25	2,300
Phosphate	"	730	4,590
Total			$1,532,341

The value of these products is calculated at or near the mines. In addition to these minerals, there is reported a large value in construction materials, as is shown in the following table:

		Quantity.	Value.
Slate	Squares	5,277	$23,247
Flagstone	Sq. yd.	3,000	2,550
Granite			120,000
Cement	Bbl.	33,500	50,250
Lime	Bush.	1,000,000	140,000
Brick	No.	120,000,000	625,000
Building stone			530,000
Total value			$1,491,047

The total value of all products, including the gold, but not including pig iron, was $3,023,568. The value of the pig iron was $256,376, which would bring the total up to $3,279,944. The number of men employed—for periods varying from full time down to two months—was 5,067; their wages amounted to $1,359,520. There were 4 men killed and 4 seriously injured during the year. This shows 0.79 killed per 1,000, the total casualties being 1.58 per 1,000 employees.

Experiments continue to be made with the black magnetic sands of the north shore of the St. Lawrence, but no commercial work has been done. The titanic iron ore reported was from Kenogami.

No work was done on the manganese ore deposits of the Magdalen islands. Assays of this ore gave from 50 up to 64.6% manganese. The ocher came from St. Malo, near Trois Rivieres, where two companies are at work. Chrome-ore mining was active during the year, two companies being at work.

The copper-mining industry was also active. The Eustis Mining Company is installing a large electric plant, operated by water power from the Conticooke river. This will enable the company to extend its operations.

Asbestos mining is being extended in the Thetford and Black Lake districts. The American Asbestos Company bought additional property and put up a large plant. The Quebec Asbestos Company was organized, and is building a large mill.

Several companies are operating in mica. The shipments in detail were as follows: 1 by 1-in. sheets, 3,200 lb.; 1 by 2-in., 46,680 lb.; 1 by 3-in., 100,885 lb.; 2 by 3-in., 88,550 lb.; 2 by 4-in., 36,450 lb.; 3 by 5-in., 14,350 lb.; 4 by 6-in., 8,050 lb.; 5 by 8-in., 3,400 lb.; total, 301,565 lb. The business has been injured by the use of various insulating compounds, in which scrap mica is utilized.

Only one graphite company was at work. There was no mining of barytes or gypsum. One company made cement, and another built works, which were started in January of this year.

The Canadian Gas & Oil Company is boring for gas in the Beausejour range, and has a good outfit. There are small wells in the province yielding natural gas at several places, among others at Yamachiche, Louisville, St. Barnabé, Ste. Geneviève de Batiscan. Some has also recently been discovered at St. Pierre les Becquets.

At these places slight borings have been effected by hand through the clay, and the gas issuing from the gravel beds is used for heating and lighting houses.

Experiments in preparing peat are being made at Farnham, but there has been no commercial production.

Wyoming Mining Statistics.

The State Legislature of Wyoming, following a recommendation made through the Governor by the State geologist, has passed an act establishing a bureau of mining statistics, which is designed to benefit legitimate mining enterprises by affording them an opportunity to make authoritative statements of their work and standing. The law provides that each company or person owning, or operating, a mining enterprise may file with the State geologist a sworn statement giving, besides the names of the company or operator, with the officers of the company, a description of the property, the amount of work done, shipments made, men employed, and other particulars with regard to the condition of the property; also the details as to the stock issued, amount expended on developments, earnings, expenses and similar particulars. These statements are to be filed with the bureau, which is under charge of the State geologist, and that officer is authorized to make them public. The operations of the act, however, are not compulsory, and the filing of such statements is optional with the company or individual operator. The statements, however, will be made under oath, and penalties are provided for any falsifications which might be contained.

Cyanidation in the South.

By Herbert A. Megraw.

It is a well-known fact that gold deposits occur in the Appalachian region. The high percentage of failure in attempts to make them payable is attributable not to the lack of the precious metal, but to the antiquated metallurgical methods and non-scientific mining generally adopted. Modern developments of metallurgical processes are pointing the way to success in this region, and the installation about to be described is an index to the trend of technical practice.

The Iola mine, in Montgomery county, is one of the productive mines of North Carolina. It is situated 2½ miles from Candor, on the Aberdeen & Asheboro railroad. The topography is rolling, and sandy soil predominates; in places the sand is only 2 or 3 ft. thick, in others it reaches a depth of 50 or 60 ft. The country rock is a metamorphic slate. There are numerous parallel veins in extensive fissures, which are irregularly mineralized. The mineralization is believed to be due to the dioritic dikes which occur at intervals.

The ore-shoot of the Iola mine resembles an inverted funnel, short on the surface and 300 ft. long at a depth of 250 ft. The vein varies in width from 4 to 8 ft. It exhibits a banded structure due to alternating clear quartz, talcose slate, clear talc and talcose quartz schist. The clear quartz does not carry gold except in the contact with the slate. All the contacts are mineralized, every crack in the schist carrying a lamina of free gold. The gold is entirely free and usually very thin and fine, although in extraordinary cases small nuggets of coarse gold are found. The strike is about 41° east with a dip 47° west. The ground-water level is reached at about 125 feet. The mine was originally worked through an incline on the vein, but this has been abandoned and development is now proceeding through a vertical shaft in the hanging wall, which cuts the vein at a depth of about 265 ft. below the oxidized zone. The value of the ore remains fairly constant. At present the average assay value is $20 to $30 per ton.

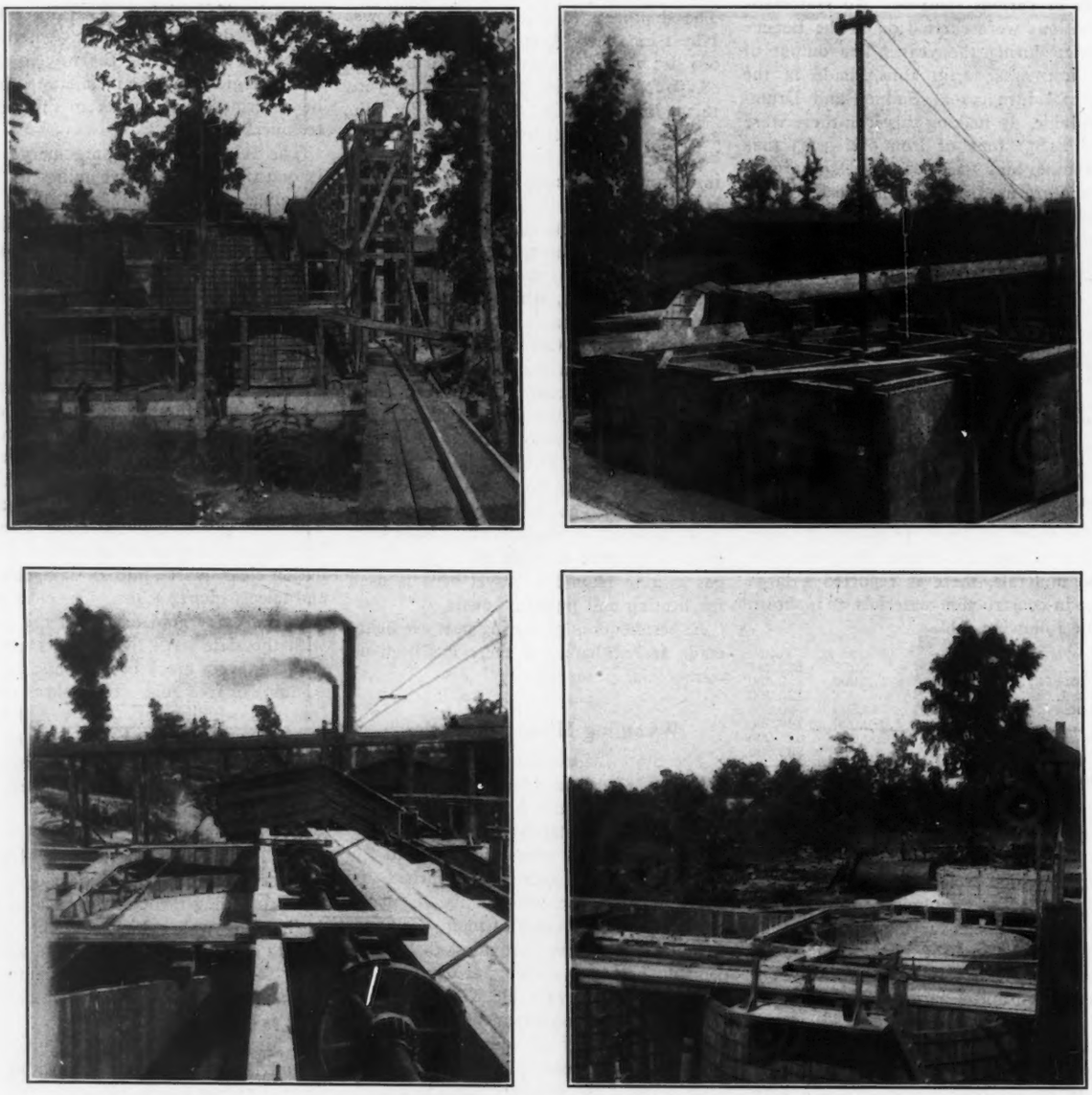
In May, 1904, I was sent to investigate the advisability of further treatment of the mill tailing by cyanide. Subsequently the plant about to be described was erected.

The ore, up to that time, was treated in a 20-stamp mill with inside mortar plates and apron-plates for amalgamation. Owing to the fine and laminated character of the gold the extraction was not satisfactory, and the tailing averaged $6 to $10 per ton. Experiments showed that this gold was readily soluble in cyanide solution, and that by separating sand from slime and treating them apart, a large proportion of the loss could be recovered at a small cost.

The cyanide plant was planned to treat a regular crushing of 40 tons per day, one-half sand and the remainder slime. The

pulp is conveyed from the mill through a launder to the foot of a belt-and-bucket elevator, which raises it 31 ft. and delivers into a launder at a height sufficient to allow the material to work through the plant by gravity. The pulp is delivered by this launder into one of a series of trapezoidal separating boats. This boat is trapezoidal in plan and rectangular in section along the center line. It contains a filter bottom slightly higher at the head than at the foot, so as to give an impetus to the pulp, allowing the fine to move easily toward the small end of the boat. The small end contains a curtain of canvas tacked to the bottom, the other end being wound upon a roller, which is managed by cords attached to the ends of the roller. The curtain bears against a wooden lattice, so that as the sand settles in the bottom of the boat the slime passes with the water over the roller containing the curtain. As the boat fills with sand the roller is lifted by means of the cord, which unrolls the curtain. The top of the roller is kept just so far above the settled sand in the boat that no sand is allowed to pass over, and no slime is allowed to settle in the boat. The separation is quite good, the sand product is clean, porous, and rapidly leachable, the slime containing practically no sand to interfere with its treatment. Fig. 1 shows two of these boats, one in operation, the other empty.

When one boat is filled the flow of pulp is diverted into another, the former being allowed to drain as dry as possible by means of a pipe in the bottom below the filter mat. When all the water possible to remove by this means has been eliminated, the sand is transferred into one of the sand-leaching tanks. There are three of these, each 20 ft. in diameter, with 4-ft. staves. This leaves them 2 ft. 2 in. deep inside. They are filled by shoveling from the separating boats and, during the transfer, lime is added to the sand at the rate of about 1 pound per ton. This shoveling is the only manual handling of any part of the material during its treatment in the cyanide plant. The ore is nearly neutral and the lime is added as a protective. Fig. 2 shows the sand and slime tanks, as seen from the top of the elevator.



VIEWS AT IOLA MINE, NORTH CAROLINA.

The time allowed for the treatment of the sand is four days; in warm weather this can be reduced. The charge receives the following amounts and strengths of solution:

4 tons containing 0.2% KCy.
4 tons containing 0.1% KCy.
8 tons containing 0.02% KCy.
8 tons containing 0.005% KCy.
6 tons containing water only.

The strong solution, 0.2 per cent, is the only one that is made up and kept in stock

at a definite strength. The second wash is the remains of strong solution after precipitation. The third wash is used unprecipitated slime solution, and the fourth wash is barren slime solution from final slime washing. Between each wash the charge is allowed to drain, and to stay dry for from 6 to 10 hours for aëration. The extraction, under favorable conditions in warm weather, is as high as 92 per cent; the ordinary extraction varies between 88 and 90 per cent.

The solution from the sand-tanks is carried through 1½-in. pipes to a box in the precipitation room. This box is always kept nearly full, consequently a regular flow through the precipitation boxes is insured. Precipitation is on filiform zinc and leaves little to be desired. The precipitation boxes are of a design already published in this JOURNAL (Dec. 5, 1903); they have proved convenient.

The slime from the separating boats is led to three tanks, each 20 ft. diam., with staves 8 ft. long. A central horizontal shaft runs over the center of the three tanks. This shaft moves, by means of bevel gear, a vertical shaft, which carries two arms, or paddles, near the bottom of the tank, so as to keep the pulp in motion. Each tank is also provided with a decanter, made of 3-in. pipe, and elbows arranged like a T and attached to a pair of flanges to the side of the tank, about 2 ft. from the bottom, by means of a loose elbow. The decanter is thus movable, and solution can be decanted from the tank to any desired depth.

The pulp enters these tanks through a launder and a short box, running below the level of the solution when the tank is full. By means of this sub-level delivery the settling of the slime is accelerated, obviating disturbing surface currents. While the tank is filling the decanter is fixed near the top of the tank, and through it the nearly clear water escapes, to be carried back to the mill pond for re-use or is discarded, according to current needs. When a proper amount of slime is collected the charge is allowed to settle, the clear water drawn off as near to the slime as possible and lime and cyanide solution added to the charge.

The very talcy nature of this slime renders it more difficult to handle than the slime produced from quartz ores. It settles readily enough, but once settled it retains a considerable amount of water, and forms a jelly-like mass, which is very tenacious and hard to move. In this treatment lime at the rate of 0.5 lb. per ton is used. Four parts by weight of solution and one part of dry slime constitute the charge ready for treatment. When ready the charge is agitated by means of the paddles and a 4-in. centrifugal pump, which is connected by suction to the bottom and by delivery to the top of each of the three tanks.

The pump is provided with a small valve for intake of air. The function of this pump is to assist in the agitation of the pulp, and to provide sufficient air for proper aëration of the charge. It is also used to empty the treatment tanks when treatment is over. The cyanide solution is made up to .02 KCy and agitation continued for 24 hours. At the end of this time the agitating devices are shut off and the slime settles. When closely settled the solution is drawn off into a tank 25 ft. in diameter and 8 ft. deep. This tank acts as a storage for unprecipitated slime solution, and a regulator for solutions entering the precipitating boxes. When the solution is decanted from the charge as closely as possible, a wash consisting of previously precipitated slime solution, weak in cyanide, is added. In amount, this wash is about two-thirds of that used in the first treatment. The wash is stirred by the paddles and pump for about one hour to effect a thorough mixing and consequent washing of the slime. This wash is allowed to settle and is decanted to the storage tank, after which another wash is added and handled identically. The final wash, following, is less in amount, and consists of barren solution weak in cyanide, or water, the general conditions of the plant determining which shall be used. This final wash is mixed and agitated thoroughly, and is then pumped into one of two slime-settlement tanks. These are 20 ft. in diameter and 12 ft. deep. In these the slime is settled as long as circumstances will permit. They will hold several charges which are pumped alternately into the tanks, the object being to permit the material to have the maximum time for settlement, so that the greatest possible amount of solution may be saved. This solution is drawn off by decanters similar to those in the treatment tanks, and is collected in a sump below.

Photograph No. 3 shows the top of the slime tank, the line shaft and gearing operating the agitators.

There are four sumps, each 20 ft. in diameter and 8 ft. deep. One is used as a sump for strong solutions, one for weak solutions, one as a water-storage tank, and one as a storage for strong cyanide solution.

Owing to circumstances having to do with the mining and milling, the plant has not yet been operated to its capacity. The highest amount treated has been 20 tons in 24 hours. This, of course, makes the expense per ton higher than it would be at the highest capacity. The power is furnished by a 20-horsepower engine, taking steam from the central boiler plant. This engine furnishes ample power to handle to maximum capacity of the plant. However, even taking the lower tonnage, the cost is not high, and the economy of the plant is evident.

Photograph No. 4 shows a view of the plant from below, including the launder from the mill, two of the sump tanks, the solution-storage tank, one of the slime-settlement tanks and two of the slime-treatment tanks. The sand-leaching tanks are immediately back of the slime tanks. A part of the precipitating room and engine house are shown on the right, just back of the elevator.

The ore being nearly neutral, the amount of cyanide actually consumed in treatment is very small. About 0.2 lb. per ton of slime and 0.4 lb. per ton of sand represent the actual consumption. The loss in other places, including that discharged in the residues, brings the total to slightly less than 0.75 lb. per ton of ore.

The plant has hardly been running long enough to get any reliable data, and the consumption appears to be small. In fact, it is expected to reduce all of the running expenses when the system has been thoroughly reduced to its simplest form.

On a basis of 20 tons per day the present cost is, for labor, $0.25; for lime, $0.02; for power, $0.21; for incidental expenses, including oil, packing, chemicals, etc., but excluding zinc, $0.02; making a total of $0.50 per ton. This, of course, does not include the expense for administration, assaying or depreciation.

This plant embodies no principles that are not already known and tested in other parts of the world. They have been successful there under competent administration. It is believed that this plant, however, represents the first attempt in North Carolina to apply the separate-treatment idea to the cyanide process, and its success shows that the process is applicable to many of the Southern low-grade ores, particularly the talcose slates, examples of which are not rare. It is believed that the process will point the way to success with properties which cannot be profitably handled in any other way.

OZOKERITE. — The principal producing district in the world is Galicia, where in 1904 a total of 2,908 tons was mined from the oil-bearing shale in Boryslau and the neighborhood. A large part of this output was exported to the United States, where crude ozokerite sells at 11.5c. per lb., and refined (ceresin) at 13.5@16.5c. per lb., according to quality. The consumption is centered chiefly in the manufacture of candles, ointments and pomades. Under the name of 'okonite,' a residual product from purifying the crude ozokerite, is an admirable insulating material for electrical cables. For this purpose the ozokerite residuum is mixed with india-rubber. Some shoe blacking is also made from ozokerite, because it gives a glossy surface.

The first steam-stamp, for mining purposes, was erected by Ball at a copper mine in North Carolina, the second was put up at the Copper Falls mine on the Keweenaw peninsula, and the third at the Pewabic mine, which now forms part of the Quincy.

Cupellation and Parting.*

By T. Kirke Rose.

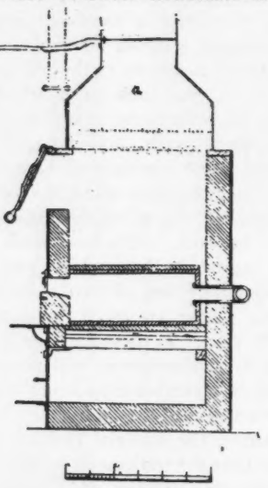
The design of a muffle for cupellation is not a matter of indifference. The requirements are durability of the muffle, perfect control over temperature and draught, and, in bullion assaying at least, a uniform temperature throughout. A convenient muffle fulfilling these requirements is shown in place in a coke furnace in the illustration. The muffle has been in use in the Assay Laboratory at the Royal Mint, London, during a period of twelve months. It is made of graphite (the 'Salamander' brand of the Morgan Crucible Company), and is consequently not easily cracked or broken. No interference is caused by the graphite, which disappears from the interior of the muffle the first time it is used. There is no connection between the interior of the muffle and the space of combustion, whether the fuel is coke or gas. Air enters at the front and passes out at the hole at the back, which communicates with a tube of 1½ in. diameter passing out at the back of the furnace and leading to the flue. The tube is of graphite inside the furnace, and iron outside. It is provided with a damper for regulating the draught of air through the muffle. This arrangement has been found satisfactory, and since its adoption the regulation of cupellation has become much easier. With a muffle 6½ in. wide inside and 15½ in. long, and 72 bullion assays, or 18 buttons from ore assays, cupelling at one time, the damper in the tube must usually be three parts shut to prevent too rapid a draught. The air is admitted near the top of the front only, and irregularity of working is avoided in this way. Attempts to admit some air near the back of the muffle, as well as at the front, resulted in irregularity in the work. When air is admitted only near the top of the muffle, the buttons at the back of the furnace work off almost as fast as those at the front.

The temperature of cupellation in gold ore assaying is a matter of great importance. Pure lead melts at 326° C., and 'uncovers' at about 675° C., a rather low red heat. Litharge freezes at about 640° C. A good temperature for the air in the muffle is 700° C., which need not be reduced throughout the operation. This temperature is too high for feathered crystals of litharge to form on the cupel. Absorption of the litharge is complete, but losses are nevertheless low. When antimony, iron, etc., are present in the buttons, the temperature must be much higher or the buttons will freeze, and time is saved in all cases by using a temperature higher than 900° at first; but the losses are then greater. The increase in loss with rise of temperature is illustrated by the following mean results, obtained by cupelling known amounts of pure gold and silver and consequently parting the beads.

The temperatures were measured by means of a thermocouple.

Charges.	Losses in Cupellation at 700° C.	Losses in Cupellation at 900° C.
Gold, 0.001 gm. Silver, 0.006 " Lead, 25 "	Gold, 0.45%	Gold, 1.05%
Gold, 0.001 gm. Silver, 0.010 " Lead, 25 "	Gold, 0.39%	Gold, 0.80%

This increase with temperature of the loss of gold in cupelling under the conditions of ore assaying has, of course, been observed before, but it is not always realized that it occurs at such moderate temperatures. The beads set in the furnace at 900°, their melting point being above 950°. Attention has often been called to the decrease in the loss of gold with increase of silver noticeable in the results given above. Attention has been drawn to the influence of the cupel by Mr. T. Lane Carter[1] and others.



MUFFLE.

The following mean results afford a comparison between the magnesia cupels and bone ash:

	Losses of Gold at 900° in Magnesia cupel. London make.	Bone ash cupel. London make.	Bone ash cupel. French make.
Gold, 0.001 gm. Silver, 0.004 " Lead, 25 "	1.9%	1.2%	1.8%
Gold, 0.001 " Silver, 0.008 " Lead, 10 "	1.4%	0.9%	5.2%
Gold, 0.5 " Silver, 1.25 " Lead, 10 "	0.060%[2]	0.055%[3]	Not estimated.

The French cupels were marked "Deleuil" on the base of each one. The results given are the means of three concordant results. It seems clear that some "Deleuil" cupels are not trustworthy. At the Royal Mint they were tried in bullion assaying, but the results obtained were not good, and they are never used now.

The conclusion is obvious that cupel absorption cannot be taken for granted under any circumstances, but must be tested at frequent intervals.

The results of some experiments on the losses in cupellation due to the presence of various impurities in the lead buttons are given in the following table. The cupellations were made at about 1,000° C. to prevent any possibility of freezing in the case of some of the buttons. In each case the charge consisted of 1 mgm. of gold, 4 mgms. of silver and 1 gm. of the impurity, with 25 gms. of lead.

Impurity.	Loss of Gold. %	Loss of Silver. %	Remarks.
None	1.2	11.8	.....
Tin	2.0	13.9	Slight scoria.
Arsenic	3.9	16.3	Much "
Antimony	5.3	13.2	No "
Zinc	9.3	17.6	Much "
Cadmium	3.5	13.1	Ring of "
Iron	4.0	16.6	No "
Manganese	13.6	24.3	Some "
Molybdenum	11.0	26.2	No "
Vanadium	7.7	21.7	No "
Copper	10.0	32.6	No "
Bismuth	21.8	27.9	No "
Thallium	23.1	34.4	No "
Tellurium	55.8	67.9	No "
Selenium	54.1	64.5	No "

In no case was proof afforded of any loss by volatilization. When tellurium and selenium were present, practically the whole of the missing gold and silver were recovered by fusing the cupels. The percentage losses appear very high, but it must be remembered that the absolute losses were very small. The heavy losses caused by bismuth and thallium are noticeable, as these metals are not easily recognized in the course of cupellation, and their presence might be overlooked by the assayer. The tellurium and selenium showed their characteristic fumes, but the beads were not subdivided and the cupels were not stained. It required close inspection to observe the fumes in the muffle. The results afford proof of the desirability of passing pure lead buttons only to the cupel.

Parting.—The percentage of silver required to be present in the bead when ready for parting has never been adequately discussed. The ratio of one of gold to three of silver is often tacitly assumed to be the best, although it is doubtful whether it is used by any assayer for small beads, and is certainly a highly inconvenient one, requiring vigorous boiling for twenty minutes or more for complete dissolution of the silver. Many assayers have been taught to use the ratio of one to five or six to insure that the bead may break up, and confidence in the completeness of the parting thus be obtained. A broken-up bead is, however, not at all easy to manage, and if fine particles of gold are present, as, for example, when cold acid is used with a large (5 to 10 mgm.) bead, some of the gold is almost certain to be lost in washing. I have used the following method for some years, and find it rapid, convenient and accurate. The porcelain crucible is nearly filled with nitric acid of sp. gr. 1.25 (four parts of acid to three of water), and the acid raised to boiling on the hot plate. The

*Abstracted from the *Journal* of the Chemical, Metallurgical and Mining Society of South Africa, January, 1905.

[1] The Engineering and Mining Journal, May 24, 1902, p. 728.

[2,3] These are real losses, not apparent ones. There were apparent gains of 0.02 and 0.025 respectively.

watch-glass cover of the crucible is then removed for an instant and the flattened bead dropped in. Under these conditions parting is rapid and complete, and the bead, whatever its composition, hardly ever breaks up. Even if it does, the particles are not small, and are easily washed. If the gold weighs less than 0.1 milligram, it does not break up, even if the proportion is 1 to 40 or 50 of silver. With 0.2 mgm. of gold, ten times its weight of silver answers very well. These small beads with much silver part almost instantaneously. With 1 mgm. of gold, 6 to 10 mgm. of silver may be used, and with 10 mgm. of gold at least 40 mgm. of silver. These large beads are parted by the boiling acid in from five to ten minutes, and no second acid is required.

Charge for Cupellation.		Ratio of Gold to Silver.	Weight of Parted Gold.
Gold	1.085 mgm.	1:5.9	1.08 mgm.
Silver	6.4 "		
Gold	1.125 "	1:5.2	1.12 "
Silver	5.85 "		
Gold	9.9 "	1:4.0	9.89 "
Silver	39.9 "		
Gold	10.265 "	1:3.9	10.26 "
Silver	40.35 "		
Gold	0.97 "	1:8.3	0.96 "
Silver	8.1 "		
Gold	0.87 "	1:9.2	0.87 "
Silver	8.0 "		
Gold	0.065 "	1:34	0 065 "
Silver	2.21 "		

Lead in each case 2 gm.

In none of these cases was there any sign of breaking up of the gold. If the flattened heads had been dropped into cold acid they would have broken up, and the gold would have been difficult to wash. The balance used turns easily at 0.005 mgm. Balance bias was avoided by weighing by substitution.

If hot acid is used, silver may be added to the pot charge with perfect safety, provided that the bead is weighed roughly before being parted, in order that confidence may be felt that the parting has been complete.

British Pig Iron Production.

The total production of pig iron in Great Britain in 1904 was given in the JOURNAL of March 30. The figures in detail are given in the table below, in long tons:

	1903. Tons.	1903. Per ct.	1904. Tons.	1904. Per ct.
Forge and foundry	3,875,826	44.0	3,841,975	44.9
Hematite	3,760,422	42.7	3,362,883	39.3
Basic	991,610	11.2	1,192,120	13.9
Spiegel and ferro	183,346	2.1	165,680	1.9
Totals	8,811,204	100.0	8,562,658	100.0

Basic is the only grade of iron showing an increase. Hematite, in the British returns, corresponds to our bessemer pig. The total decrease was 2.8% last year.

The decreased production was not spread over all the iron-making districts of the country. In Scotland, Cleveland, Lincolnshire, North Staffordshire, Shropshire, Nottingham and Leicestershire and North Wales there was an increase of output, while in Durham, West Cumberland and Lancashire, South Wales and Monmouth, Northamptonshire, Derbyshire, South Staffordshire, and South and West Yorkshire there was a decrease.

High-Tension Underground Hauling Gear.*

Although the use of electrical power for the main winding of coal pits appears to make little headway in Great Britain, there is no doubt that for underground work, such as hauling, coal-cutting and pumping, it is rapidly becoming general. As in other electric-power schemes, the questions of the nature of the supply—whether alternating or continuous current—and the best voltage to be employed depend altogether upon the extent of the scheme and the kind of the work to be done. No alternating-current machinery possesses the speed regulation possible with continuous current; but the mechanical simplicity of the induction

FIG. 3. METHOD OF CARRYING WIRES.

motor, and the fact that three-phase transmission at high tension is the cheapest method of supplying energy at long distances, render the alternating system specially advantageous in the larger collieries.

The extensive collieries of Messrs. Bolckow, Vaughan & Co., in the county of Durham, have recently been equipped with electrical machinery in place of the steam engines formerly in use underground. The steam haulages were satisfactory as long as the seams were level and the working faces did not extend farther than 3,000 yd. or so from the bottom of the shaft. At their Auckland Park colliery, however, at a distance of about two miles from the shaft, a dip in the seam was encountered, forming a long and heavy incline. Horse haulage on this slope proved unsatisfactory, and as the sinking of a new shaft was out of the question, it was decided to instal electrical hauling gear, not only at this point, but throughout the entire collieries. The latter were so widely scattered that for power-supply purposes they were divided into groups, the Auckland Park and Binchester collieries being the first two groups to be equipped. Each group has its own central generating station at which steam is raised from the waste gases of the existing coke ovens. A three-phase high-tension system of distribution was decided upon, and the first plant put down at each of the stations consisted of a pair of three-crank compound Wilans engines, direct coupled to three-phase alternators supplied by the Electrical Company, Ltd., each with an output of 200 kilowatts at 2,400 volts when running at 340 rev. per min. The exciters are belt-driven from the alternator shafts. Lancashire boilers, fired by coke-oven gas, supply steam at 150 lb. pressure at the engine stop-valve. Space was left at each station for the erection of a third set of machinery when necessary. Careful tests of the plant erected have shown that the generating costs per unit do not exceed 0.48c., including maintenance and interest.

The switchboards are of the cubical type, the generator panels being fitted with oil-break switches and tubular fuses, and the other usual apparatus. Overhead bare copper transmission lines are employed above ground, while in the shafts and galleries the current is carried by armored cables supplied by the Electrical Company. Special clamps attached at every 6 ft. to the buntings support the cables in the shaft, while along the galleries they are carried by hempen slings hung from miners' nails driven into the pit-props or cemented into the roof, as shown in Fig. 3. Junction-boxes are provided about every 200 ft. down the shaft, and every 858 ft. in the bottom. There are about 5 miles of overhead line, and 15 miles of cable underground.

At present the electrically driven plant consists of five 110-h. p. main haulage gears, two 30-h. p., one 46-h. p., and one 60-h. p. endless haulage gear, and two 85-h. p. staple pit winding gears. There are also several motor-driven pumps and one fan. On the surface, coal-washing, screening and handling machinery are electrically driven. The lighting of the collieries, both above and below ground, is, as far as possible, done electrically. For the lamps the current is transformed down to either 220 or 100 volts by a 75-kw. transformer at each station, and by several 1-kw. transformers below ground.

Two of the main haulage gears are installed at a distance of more than 2 miles in-bye. The general arrangement is shown in Fig. 1 and 2. It was designed for working the heavy inclines, the empty tubs going down to help the motor when hauling up the full ones. At present it only works as a single-drum gear, and is designed to haul a maximum load of 30 trucks, each weighing 8 cwt. empty and 28 cwt. loaded, up an incline of 1 in 4 to 1 in 6, about 3,000 ft. long, at a speed of from 6 to 7 miles an hour. The drum is 4 ft. in diameter, and is driven through double-reduction gear and a flexible coup-

*From *Engineering*, London, March 17, 1905.

ling by a 110-h. p. motor running at 695 rev. per min. The motor is of the slip-ring type and is provided with a controller for starting, regulating and reversing. The controller has two mechanically interlocked drums operated by one hand-wheel, one drum controlling the stator, and the other the rotor, and each immersed in its own oil-box. The resistance is arranged to be cut in or out by 25 steps in either direction. At present the motor is only reversed for shunting, or slackening the rope, the empty tubs running down the gradient by their own weight when the driver releases the drum by throwing out a clutch. A foot-brake acting on the drum controls the speed of the tubs.

The furthest point to which electricity is conducted is three miles in-bye, where one of the high-tension motors, fitted with a liquid starter, is installed to work an endless haulage. The staple winding gears raise the coal from the lower to the upper seam, one gear being situated at each level. Two miles in-bye a 30-h. p. high-tension motor drives a fan to improve the ventilation of the pit.

Power from the Auckland Park station is also taken to the Shildon Lodge Colliery, a distance of 9,000 ft., by means of a three-core cable. At the Shildon Lodge pit an extensive pumping plant is being installed, the pumps being of the multiple-stage high-lift centrifugal type. The lower or Brockwell seam pump is direct-coupled to a 200-h. p. high-tension motor running at 1,175 revolutions, and delivering 700 gal. of water per minute against a head of 565 ft. into a sump in the Harvey seam above. Into this sump the Harvey seam is drained, and a second pumping plant, of 295-h. p. at 1,175 revolutions, lifts 1,200 gal. per minute against a head of 495 ft. to a reservoir on the surface. Each motor is provided with its own switchboard, carrying an oil-switch, enclosed fuses, etc. The plant has been supplied by the Electrical Company, Ltd., of London, the representatives in England of the Allgemeine Elektricitäts Gesellschaft of Berlin. It has now been working for about 18 months, with entire satisfaction, and is being extended, thus showing that high-tension motors may be worked without difficulty in coal-pits at very great distances from the bottom of the shaft.

FIG. 1.

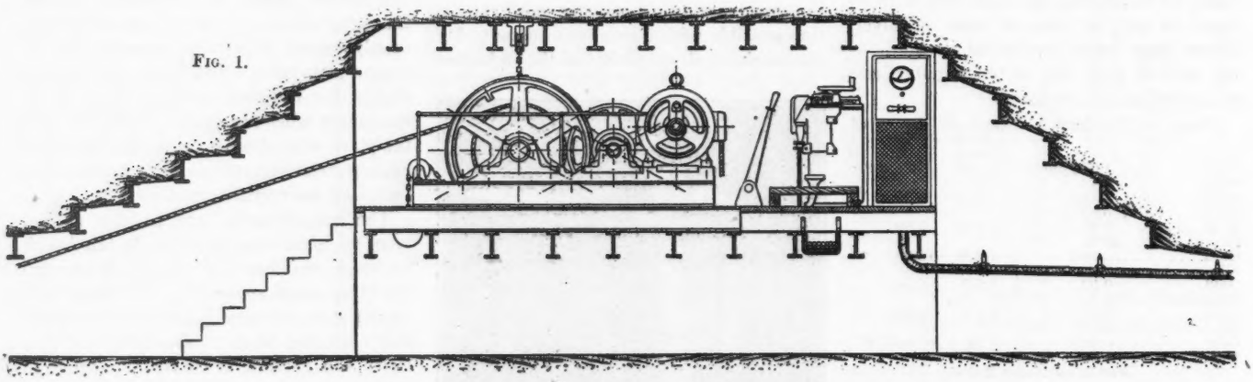
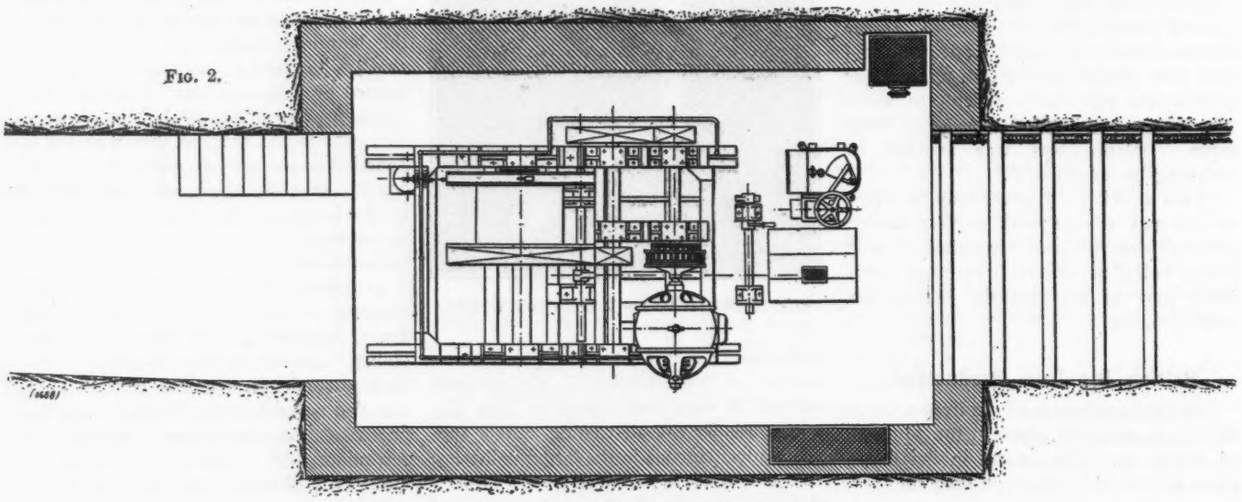


FIG. 2.



UNDERGROUND ELECTRIC HAULAGE PLANT.

The mud from Fango and the soil from Capri, in Italy, show radium qualities in their fractions, though no uranium could be detected. The Fango mud is an article of export, for use in therapeutic baths. It has been used in this way for a long time in different countries.

Books Reviewed.

The New York Public School. A History of Free Education in the City of New York. By A. Emerson Palmer. With *Introduction* by Seth Low. New York; The Macmillan Company. London; Macmillan & Company, Ltd. Pages, 472; illustrated. Price, $2.50.

This book was prepared on the occasion of the centennial celebration of the establishment of free schools in the city of New York. Mr. Palmer had the advantage of access to all official data, and has written an interesting account of the establishment, growth and present condition of the public school system in New York.

New Mexico Mines and Minerals. World's Fair Edition. 1904. By Fayette A. Jones. Santa Fé, New Mexico; The New Mexican Printing Company. Pages, 360; illustrated. Price, $2.

This book was prepared to show the mineral resources of New Mexico, and intended for use at the Louisiana Purchase Exposition. It is much more than a catalogue or an advertising prospectus, however. It contains a summary of the geology of the Territory; a general description of its important mineral resources; and many details regarding the different

districts and mines. It is a readable account, with much interesting information, and is well illustrated by maps, geological sections and reproductions of photographs.

Les Amalgames. By Léon de Mortillet. Paris, France; Bernard Tignol. Pages, 52.

A short treatise describing the amalgams of the chief light and heavy metals, and their applications. The pamphlet is published as No. 103, of the 'Bibliotheque des Actualities Industrielles,' by the Libraire de l'Ecole Centrale des Arts et Manufactures. It comprises, in the limits available, a practical description of this function of quicksilver as an alloy maker.

Transactions of the American Ceramic Society. Volume VI, 1904. Columbus, Ohio; published by the Society. Pages, 286; illustrated.

This is Volume VI of the series of annual reports, and comprises the papers and discussions of the Cincinnati meeting of February, 1904. The papers are mainly technical, and treat of clay and cement in their pyroscopic relations; but the esthetic side of this art is not ignored. The 21 papers are full of interest and value, and deserve an index which, unfortunately, is not furnished. The Society numbers 166; the secretary is Edward Orton, Jr., of Columbus, Ohio.

Gas Engines and Producer Gas Plants. By R. E. Mathot. Translated from the French by Waldemar B. Kaempffert. With *Preface* by Dugald Clerk. New York; the Norman W. Henley Publishing Company. Pages, 328; illustrated. Price, $2.50.

The gas engine has made great advances in recent years. It is gaining rapidly in estimation, and its use is extending, as its advantages and economy are better appreciated. This will, doubtless, be assisted by the remarkable results obtained with producer gas at the fuel-testing station in St. Louis, showing the possibility of utilizing inferior grades of coal to the best advantages. As explosive engines are becoming better known and more generally used, it is evident that they require more care than a steam engine, to produce the best results. In other words, the difference in economy between a gas engine properly run and cared for, and one neglected and carelessly handled, will be much greater than in the case of two steam engines under similar conditions. There is the more need of careful instruction, and of reliable text-books and reference-books. The gas engine, thus far, has reached its best development in Belgium and Germany, and has been most carefully studied in those countries. It is, therefore, natural that the best book on the subject should come from a Belgium author; and the publishers have done engineers good service in presenting in English form the excellent work of M. Mathot. The book is a practical and useful one; it does not go too deeply into theory, nor does it strain the mathematical knowledge of the reader. It is well illustrated and clearly written. The class of engines considered includes the smaller ones—200 h. p. and less, down to the smallest—the development of the very large engines, as now built, being reserved for a future volume. Everyone who uses, or expects to use, a gas engine can read this volume with advantage—and the class named is a large one.

Books Received.

In sending books for notices, will publishers for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

A Statistical Account of Australia and New Zealand. 1903-1904. Compiled by T. A. Coghlan. Sydney, N. S. W.; Government Printer. Pages, 1,042.

Automobiles. Vapeur—Petrole—Electricité. By H. Rodier. Paris, France; *Annuaire Technique.* Pages, 152; illustrated. Price (in New York), $4.25.

New Zealand. Papers and Reports Relating to Minerals and Mining. Prepared by the Department of Mines. Wellington, N. Z.; Public Printer. Pages, 152; illustrated.

Western Australia Geological Survey. Preliminary Report on the Pilbara Goldfield. By A. Gibb Maitland. Perth, W. A.; Government Printer. Pages, 120; with maps.

Les Gisements de Cuivre du Katanga. By H. Buttgenbach. Liège, Belgium; reprinted from the *Transactions* of the Societè Geologique de Belgique. Pages, 52; with maps.

Die Neueste Entwicklung der Wasserhaltung. By Professor Baum. Assisted by Doctor Hoffman. Berlin, Germany; Julius Springer. Pages, 116; illustrated. Price (in New York), $1.40.

Lehrbuch der Mechanisch-Metallurgischen Technologie. By A. Ledebur. Second Part. Brunswick, Germany; Friedrich Vieweg & Sohn. Pages, 424; illustrated. Price (in New York), $4.25.

United States Geological Survey. Bulletin 252. Preliminary Report on the Geology and Water Resources of Central Oregon. By Israel C. Russell. Washington, D. C.; Government Printer. Pages, 140; illustrated.

United States Geological Survey. Water Supply and Irrigation Paper No. 121. Preliminary Report on the Pollution of Lake Champlain. By Marshall Ora Leighton. Washington; Government Printing Office. Pages, 120; illustrated.

Three successful electro-steel furnaces are those designed respectively by Héroult, Keller, and Kjellin and Benedicks.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
Letters should be addressed to the Editor.
We do not hold ourselves responsible for the opinions expressed by correspondents.

Integrity.

Sir—Were one asked to specify the most valued asset of man, touching the professions—especially that to which many of us are members, viz., mine-engineering—perhaps no single expression could be half so comprehensive as that expressed by the word 'integrity.' A word in common usage; one, moreover, at times applied in the 'characters' or 'testimonials' given to worthy employees. It is fitting, therefore, to inquire further into the precise meaning of this term, and ascertain the qualifications essential for its acquirement and bestowal.

'Integrity' comes to us from the Latin; *in,* 'not,' and *tangere,* 'to touch'; literally, 'untouched'—the state of being entire or complete; wholeness.

Webster defines this quality thus: "Moral soundness; honesty; freedom from every blasting or corrupting influence or motive: used especially with reference to dealings between men in the fulfilment of contracts, the discharge of agencies, trusts and the like; uprightness."

Buckminster quotes: "The moral grandeur of independent integrity is the sublimest thing in nature, before which the pomp of Eastern magnificence and the splendour of conquest are odious as well as perishable."

The very pith or essence of this quality consists in the fundamental idea of wholeness or complete entity. Not so much that to which we may attain, but rather that from which we may be parted. The duties of the engineering profession, in common with all others—but more especially, perhaps, that of mining engineering—call imperatively for this qualification and accentuate its paramount importance, from the fact that, in its service more than in most others, younger men are placed in positions of commanding responsibility or trust; being often slightly, if at all, previously personally known to their employers.

Above the accruing merits of a college education or technical graduation is placed the rugged worth of man's integrity—man's rating as a man; for without this basic quality all accessories serve but as thin draperies covering nakedness beneath. It is, therefore, clearly seen how this attribute becomes pre-eminent, and how—especially to those on the outward voyage of life's work—the continuity and unbroken sequence of honorable positions honorably filled is of vital import in shaping and maintaining the professional career. It is most probable, moreover, that the desire to satisfy themselves on this

especial feature accounts for the testimonials that are required of candidates for all important positions, and in most cases, unless the possession of this all-important quality can be demonstrated, despite all other qualifications, the applicant meets with but scant success.

Integrity embraces and demands a comprehensive review of the ladder of progress, with every rung sound. Many are the difficulties of life, especially those pertaining to the professional life. What of it? To accept the difficulty, the arduous task; to fulfil the trust, so that the sequence of honorable records shall be unbroken, and the chain of evidence amply solid at its weakest link; the personal character of the individual untouched, unblemished; this is integrity; this the spirit that achieves success in its highest terms. It is probably unnecessary to emphasize here the absolute incompatibility of integrity with 'graft,' no matter under what usurping pseudomorph. The spirit of integrity and graft are inconceivable in one and the same mind. There may be those who would censure such a declaration as squeamish or mawkish. Possibly; be that as it may. There are others, however—the majority or minority, who knows?—who account such a principle as the very marrow of that corporate entity, the body professional.

The fundamental quality of integrity, as has been stated, is entirety; to remain whole. The crystal chalice, were it to suffer a fall, though it be repaired never so cunningly, could scarce claim its pristine and symmetrical wholeness, though still, for many practical purposes, satisfactory. This, then, is the main feature to be thrown into high relief—integrity is entirety, or wholeness. How many are the ways, how subtle and how devious the methods, by which the citadel of man's manhood is assailed, probably all men of any considerable experience know full well. Assault, stratagem, innuendo—even green-eyed jealousy and miasmic suspicion—singly or combined, need not avail for its capture, nor impair its entity, if but the import of its treasure be realized, and the strenuousness of its defense be unabated from day to day, from year to year.

It is needless to be more specific as to the many alluring and ofttimes plausible temptations that present themselves to us all, in all kinds of business, in all positions of trust. But no matter under what guise they come, if but once the charge be carried home and the defense broken, we shall do well to remember that our entirety as a jewel of inestimable value like the diamond—in hardness and luster surpassing all others—touched by the lightning's flash, is then shattered; never again to shine with resplendent facets, but to remain naught but a pinch of ashes, unlovely to the eye, and bitter to the taste.

The best thing that can be said of any of us—surpassing far fertility of brain, or sparkling genius of tongue or pen—is that we are 'entire'; that integrity is ours. The misfortune the most dire is to lose that epitome of virtue, that compendium of a good name, our integrity. To preserve this gem, this moral trust, necessitates the strenuous life; for no sloth, craven, or ignoble, ever guarded its essentials intact. To men of moral brawn, resplendent courage and transparent honesty, alone, is it given to conserve this trust inviolate.

APOLOGIA.

The Mexican Duty on Dynamite.

Sir—The later phases of this unwise burdening of the mining industry are most significant, but they are not encouraging to those who would impute only noble motives to the Government officials. Of course, the most notable occurrence of recent date in connection with this duty is the meeting of mining engineers in the City of Mexico. It is well known that the meeting was originally called as an organized protest against the dynamite duty. Not that this tax is the only grievance, but it represents the culmination of a series of taxes which work hardship to the miner, both by their number and their very considerable total. The call for the Mining Congress was addressed to the leading men in the profession. It is not surprising that some of these should have found themselves so involved with business connections that it was not wise for them to appear publicly in active personal connection with a movement which might take the form of an impolitic protest. But it is surprising that this convention was so packed with representatives of the trust that the primary object of the meeting was smothered, and the committee which met President Diaz on March 22, proceeded to a recitation of grievances which absolutely ignored the main issue, and which was carefully keyed (in pre-established harmony?) to a series of petitions which the President could consider favorably. They were as follows (*Mexican Herald*, March 23, 1905):

1. The suppression of the 2% coinage tax on the value of silver, established by the decree of March 27, 1897, and its reduction to 0.5% in the case of gold.
2. Reduction to cost of the duties on separating, assaying, reducing and refining, and the application of those duties exclusively to bars of metal presented to the mints for those operations.
3. Reduction of the 3% stamp tax on the value of gold and silver to 1 per cent.
4. Reduction of the 2% State tax on the value of gold and silver to 1.5 per cent.
5. Monthly fixing, by the finance department, of the price of silver, copper and lead, which is to serve as basis for the collection of Federal and State taxes, this price to be founded on the average quotation of those metals on the New York market during the preceding month.
6. Reduction by 10% of the assay estimate in the collection of the duties on ores that are to be shipped from one State to another or exported from the Republic. This must be done by deducing from the weight of the ore that of the moisture which it contains.
7. Reduction, from $10 to $5 per *pertenencia*, of the tax on gold, silver and platinum mine titles, as established by the law of June 6, 1892.
8. Reduction, from $10 to $5 per *pertenencia*, of the annual property tax on gold, silver and platinum mines as established by the previously mentioned law.
9. Exemption from import duties for the articles here enumerated—sulphuric acid, mercury, sulphur, coal and coke, alkaline cyanides, hyposulphates, mine timber, nitrates of potash and soda, sulphate of copper, sheet zinc for metallurgy, and machinery and apparatuses for mines and metallurgical establishments.
10. Adequate protection, by the executive, of ore-treating establishments, which, employing new processes, such as cyanuration, are erected for the treatment of low-grade ores or of dump accumulations from old mines.

The enumeration is interesting and it does concern Mexican finance most vitally, but it is entirely foreign to the point. It would, of course, be difficult to prove this; but my own personal opinion is that the protesting convention of mining engineers was captured bodily and bent to the purpose of the dynamite trust. This opinion is entertained by the great majority of the candid men of the profession. The new *peso*, the gold basis, the limitation of coinage, the redemption fund, the reduction of some minor duties and taxes on ores and mining—these are all interesting, but they are a blind to cover the main issue and to distract attention from this. I hope you will continue the ventilation of this subject. It is high time for the leading officials to meet the issue squarely without evasion, else what you and I know about human nature may brand the government itself with a reputation that it can ill afford to carry.

Incidentally, I would venture to correct a figure in a recent editorial of yours (March 9, 1905). The equivalent of $210 Mexican, with exchange at 202, would be $103.96 gold.

AMIGO.

Durango, Mexico, March 28, 1905.

The star Castor, technically known as *alpha Geminorum*, is a brilliant double star; the components are about 5 sec. of arc apart, and it is a favorite object of contemplation by amateurs with small telescopes. Sir John Herschel called it the finest double star of the northern heavens. The components, which are not quite equal in brightness, revolve around each other in a time-period of about 350 years, hence the star is 'binary.' In 1896 it was discovered at Pulkova, Russia, that the less brilliant of the components is itself a 'spectroscopic binary' with a period of 2.9 days. Recent work in this country shows that the brighter component is also a 'spectroscopic binary' with a period of 27 days. Hence we have the curious example of a quadruple star of two pairs, the whole constituting one mechanical unit, as to the naked eye they make one optical unit.